EVALUATING VALUE BASED FINANCIAL PERFORMANCE MEASURES

By

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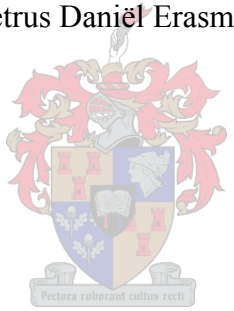

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DECLARATION

I, the undersigned, hereby declare that the work contained in this dissertation is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

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Signature

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SUMMARY

The primary financial objective of a firm is the maximisation of its shareholders' value. A problem faced by the shareholders of a firm is that it is difficult to determine the effect of management decisions on the future share returns of the firm. Furthermore, it may be necessary to implement certain monitoring costs to ensure that management is focused on achieving this objective. A firm would, therefore, benefit from being able to identify those financial performance measures that are able to link the financial performance of the firm to its share returns. Implementing such a financial performance measure in the valuation and reward systems of a firm should ensure that management is aligned with the objective of shareholder value maximisation, and rewarded for achieving it.

A large number of traditional financial performance measures have been developed. These measures are often criticised for excluding a firm's cost of capital, and are considered inappropriate to be used when evaluating value creation. Furthermore, it is argued that these measures are based on accounting information, which could be distorted by Generally Accepted Accounting Practice (GAAP). Studies investigating the relationship between these measures and share returns also provide conflicting results. As a result of the perceived limitations of traditional measures, value based financial performance measures were developed. The major difference between the traditional and value based measures is that the value based measures include a firm's cost of capital in their calculation. They also attempt to remove some of the accounting distortions resulting from GAAP.

Proponents of the value based measures present these measures as a major improvement over the traditional financial performance measures and report high levels of correlation between the measures and share returns. A number of studies containing contradictory results have been published. On the basis of these conflicting results it is not clear whether the value based measures are able to outperform the traditional financial performance measures in explaining share returns.

The primary objectives of this study are thus to:

- Determine the relationship between the traditional measures earnings before extraordinary items (EBEI) and cash from operations (CFO), and shareholder value creation;
- Investigate the value based measures residual income (RI), economic value added (EVA), cash value added (CVA) and cash flow return on investments (CFROI), and to determine their relationship with the creation of shareholder value;
- Evaluate the incremental information content of the value based measures above the traditional measures.

The information content of the traditional measures and the value based measures are evaluated by employing an approach developed by Biddle, Bowen and Wallace (1997). The first phase of this approach entails the evaluation of the relative information content of the various measures in order to determine which measure explains the largest portion of a firm's market-adjusted share returns. The second phase consists of an evaluation of the incremental information content of the components of a measure in order to determine whether the inclusion of an additional component contributes statistically significant additional information beyond that contained in the other components. The study is conducted for South African industrial firms listed on the Johannesburg Securities Exchange for the period 1991 to 2005.

The data required to calculate the measures investigated in the study are obtained from the McGregor BFA database. This database contains annual standardised financial statements for listed and delisted South African firms. It also contains EVA, cost of capital and invested capital amounts for those firms listed at the end of the research period. Including only these listed firms in the research sample would expose the study to a survivorship bias. Hence these values are estimated for those firms that delisted during the period under review by employing a similar approach to the one used in the database. The resulting sample consists of 364 firms providing 3181 complete observations. Since different information is required to calculate the various measures included in the study, different samples are compiled from this initial sample and included in the tests conducted to evaluate the information content of the measures.

The results of this study indicate that the value based measures are not able to outperform EBEI in the majority of the relative information content tests. Furthermore, the measures EVA, CVA and CFROI are also not able to outperform the relatively simple value based measure RI. The results from the incremental information content tests indicate that although some of the components of the value based measures provide statistically significant incremental information content, the level of significance for these relatively complex adjustments is generally low.

Based on these results, the claims made by the proponents of the value based measures cannot be supported. Furthermore, if a firm intends to incorporate its cost of capital in its financial performance measures, the measure RI provides most of the benefits contained in the other more complex value based measures.

OPSOMMING

Die hoof finansiële doelwit van 'n firma is die maksimering van aandeelhouerswelvaart. Dit kan egter moeilik wees vir 'n firma se aandeelhouers om te bepaal watter uitwerking bestuursbesluite op die toekomstige aandeelopbrengs van die firma sal hê. Voorts kan dit nodig wees om sekere moniteringskoste aan te gaan ten einde te verseker dat die bestuur hierdie hoofdoelwit voor oë hou. Dit behoort dus tot 'n firma se voordeel te wees om daardie finansiële-prestasiemaatstawwe te identifiseer wat 'n verband toon tussen die finansiële prestasie van die firma en die aandeelopbrengs. Die inwerkingstelling van so 'n finansiële-prestasiemaatstaf in die waardasie- en beloningstrukture van die firma sal verseker dat die bestuur voortdurend na die maksimering van aandeelhouerswelvaart streef en ook vergoed word indien hulle hierdie doelwit bereik.

'n Groot aantal tradisionele finansiële-prestasiemaatstawwe is reeds ontwikkel. Hierdie maatstawwe word egter gereeld gekritiseer omdat dit die firma se koste van kapitaal van waardeberekeninge uitsluit en word dus as ontoereikend beskou om waardeskepping te evalueer. Daar word verder aangevoer dat hierdie maatstawwe op rekeningkundige inligting gegrond is wat moontlik deur Algemeen Aanvaarde Rekeningkundige Praktyk (AARP) verwring kan word. Studies wat die verwantskap tussen hierdie maatstawwe en aandeelopbrengs ondersoek, lewer ook teenstrydige resultate op. As gevolg van die veronderstelde beperkings van die tradisionele maatstawwe, is waardegebaseerde finansiële-prestasiemaatstawwe ontwikkel. Die vernaamste verskil tussen tradisionele en waardegebaseerde maatstawwe is dat laasgenoemde die firma se koste van kapitaal by waardeberekeninge insluit. Waardegebaseerde maatstawwe poog ook om sommige van die rekeningkundige verwringings wat uit AARP spruit, uit te skakel.

Voorstanders van waardegebaseerde maatstawwe beskou dit as 'n aansienlike verbetering op tradisionele maatstawwe en rapporteer hoë vlakke van korrelasie tussen die maatstawwe en aandeelopbrengste. 'n Aantal studies met teenstrydige resultate is egter ook gepubliseer en maak dit dus moeilik om te bepaal of waardegebaseerde maatstawwe tradisionele maatstawwe in die verklaring van aandeelopbrengste oortref.

Die hoofdoelwitte van hierdie studie is derhalwe om

- die verwantskap tussen die tradisionele maatstawwe verdienste voor inagneming van buitengewone items ("EBEI") en kontant uit bedryfsaktiwiteite ("CFO"), en aandeelhouerswelvaartskepping te bepaal;
- die waardegebaseerde maatstawwe residuele inkomste ("RI"), ekonomiese waarde toegevoeg ("EVA"), kontantwaarde toegevoeg ("CVA") en kontantvloei-rentabiliteit van investering ("CFROI") te ondersoek en hulle verwantskap met aandeelhouerswelvaartskepping te bepaal; en

- die inkrementele inligtingsinhoud van waardegebaseerde maatstawwe teenoor dié van tradisionele maatstawwe te evalueer.

Die inligtingsinhoud van die tradisionele sowel as die waardegebaseerde maatstawwe is met behulp van 'n benadering geëvalueer wat deur Biddle, Bowen and Wallace (1997) ontwikkel is. Die eerste fase van hierdie benadering behels die evaluasie van die relatiewe inligtingsinhoud van die onderskeie maatstawwe ten einde te bepaal watter maatstaf die grootste gedeelte van 'n firma se mark-aangepaste aandeelopbrengs verklaar. Die tweede fase bestaan uit 'n evaluasie van die inkrementele inligtingsinhoud van die komponente van 'n maatstaf om te bepaal of die insluiting van 'n bykomende komponent statisties beduidende addisionele inligting bied bo en behalwe wat reeds deur die ander komponente verskaf word. Die studie is uitgevoer vir Suid-Afrikaanse nywerheidsfirmas wat in die tydperk 1991 tot 2005 op die Johannesburgse Effektebeurs genoteer was.

Die nodige data vir die berekening van die maatstawwe in hierdie studie is van die McGregor BFA-databasis verkry. Hierdie databasis bevat jaarlikse, gestandaardiseerde finansiële state vir genoteerde en gedenoteerde Suid-Afrikaanse firmas. Dit bevat ook ekonomiese waarde toegevoeg, koste van kapitaal en geïnvesteerde-kapitaalbedrae vir firmas wat aan die einde van die navorsingstydperk genoteerd is. Die insluiting van slegs hierdie genoteerde firmas by die navorsingsteekproef sou die studie egter aan 'n oorlewingsydigheid blootstel. Daarom is bogenoemde waardes ook vir die firmas wat in die loop van die navorsingstydperk gedenoteer is, beraam met behulp van 'n soortgelyke benadering as die een wat in die databasis gebruik is. Die gevolglike steekproef bestaan uit 364 firmas waaruit 3 181 volledige waarnemings gemaak kon word. Aangesien verskillende inligting nodig was om die onderskeie maatstawwe in hierdie studie te bereken, is verskillende steekproewe uit hierdie aanvanklike steekproef saamgestel en by die toetse ingesluit waarmee die inligtingsinhoud van die maatstawwe geëvalueer is.

Die resultate van hierdie studie dui daarop dat die waardegebaseerde maatstawwe in die meerderheid van die relatiewe-inligtingsinhoudtoetse nie daarin kon slaag om EBEI te oortref nie. Voorts kon die maatstawwe EVA, CVA en CFROI ook nie die betreklik eenvoudige waardegebaseerde maatstaf RI oortref nie. Die resultate van die inkrementele-inligtingsinhoudtoetse dui daarop dat hoewel sommige van die komponente van die waardegebaseerde maatstawwe statisties beduidende inkrementele inligtingsinhoud verskaf, die vlak van beduidendheid vir hierdie betreklik komplekse aansuiwerings oor die algemeen laag is.

Op grond van hierdie resultate kan die voorstanders van waardegebaseerde maatstawwe se bewerings dus nie ondersteun word nie. Indien 'n firma voorts van voornemens is om sy koste van kapitaal by sy finansiële-prestasiemaatstawwe in te sluit, sal die maatstaf RI die meeste van die voordele bied wat in die ander meer komplekse waardegebaseerde maatstawwe vervat word.

DEDICATION

This dissertation is dedicated to Prof. I.J. Lambrechts

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Chapter 1

INTRODUCTION: BACKGROUND, OBJECTIVES AND OVERVIEW

1.1 BACKGROUND TO THE STUDY

The primary financial objective of a firm should be the maximisation of its shareholders' value (Brigham & Houston, 2001: 16). All management decisions and strategies should contribute to this objective. Management, however, faces the problem of determining what the effect of its actions would be on the firm's shareholder value. Net Present Value (NPV) techniques are often employed to translate management decisions and actions into financial figures, and to evaluate their value creating potential. Projects with positive NPV values contribute to the shareholder value of a firm, while the adoption of negative NPV projects result in a destruction of shareholder wealth (Young & O'Byrne, 2001: 25).

Value based financial performance measures are based on similar concepts as the NPV techniques (Peterson, 2000: 69). Maximising the value based measures should, therefore, result in the maximisation of NPV, and as such, should contribute to the creation of shareholder value. These measures provide an estimate of a firm's economic profit by incorporating its total cost of capital in their calculation. In those cases where these measures yield positive values, economic profits are generated, and consequently shareholder value is expected to increase. Negative values indicate the destruction of shareholder value (Stewart, 1991: 174; Grant, 2003: 81).

Traditional financial performance measures exclude the firm's cost of capital, and no provision is, therefore, made for the opportunity cost on the capital invested by the shareholders (Young & O'Byrne, 2001: 431). These traditional measures are also based almost exclusively on information obtained from financial statements, which

are compiled according to Generally Accepted Accounting Guidelines (GAAP). Consequently, these measures are exposed to accounting distortions (Stewart, 1991: 66; Peterson & Peterson, 1996: 10; Ehrbar, 1998: 80). Despite these limitations analysts and investors still widely apply the traditional measures (Stewart, 1991: 35; Ehrbar, 1998: 41). While some studies report statistically significant relationships with share returns (Peterson & Peterson, 1996: 45), others obtain far weaker results (Black, Wright and Davies, 2001: 51).

A number of different value based financial performance measures have been developed. These include, amongst others, Economic Value Added (EVA), Cash Value Added (CVA), and Cash Flow Return on Investment (CFROI). These measures include a firm's cost of capital in their calculation (Fabozzi and Grant, 2000: 68). Attempts are also made to overcome some of the accounting distortions by adjusting information obtained from the financial statements (Young & O'Byrne, 2001: 205).

While proponents of these measures report high correlations between the measures and the creation of shareholder value (Stewart 1991: 2; Stewart 1994: 75; Walbert, 1994: 110; O'Byrne, 1996: 117), a large number of studies have yielded far weaker relationships (Biddle, Bowen & Wallace, 1997: 316; Chen & Dodd, 1997: 325; Farsio, Degel & Degner, 2000: 117). It is thus not clear whether the implementation of a value based measure will actually benefit a firm in its quest to maximise its shareholders' value. It is against this background that this study will be conducted.

1.2 OBJECTIVES OF THE STUDY

1.2.1 PRIMARY OBJECTIVES

- To determine the relationship between the traditional financial performance measures and shareholder value creation.

- To investigate the value based measures EVA, CVA and CFROI, and to evaluate their relationship with the creation of shareholder value.

- To evaluate the incremental informational content of the value based performance measures above the traditional financial performance measures.

1.2.2 SECONDARY OBJECTIVES

- To implement a number of adjustments to the value based measures suggested in the literature, and to evaluate the influence of these adjustments.

1.3 HYPOTHESES

The information content of a financial measure refers to the additional information that the market deduces from its publication and incorporates into the expected future financial performance of the firm. The primary objective of this study is to compare traditional and value based financial performance measures in terms of their ability to evaluate shareholder value creation. In order to address the research objective, this study evaluates the relative information content of the measures investigated. Furthermore, the incremental information content of the contributing components of the various measures are examined to determine whether they contain significant information beyond that already included in the other measures investigated.

The following null hypotheses are, therefore, formulated:

H_{01}: There are no differences in the information content of the various measures.

H_{02}: A specific component of a measure does not provide information content beyond that provided by the remaining components.

1.4 SCOPE OF THE STUDY

In the first part of the dissertation, a number of value based measures are identified and discussed. The focus is placed on their theoretical foundations, calculation and interpretation. An overview of existing studies reporting on the relationship between these measures and shareholder value creation is also provided.

The second part of the dissertation involves the empirical analysis of the measures. A number of traditional and value based financial measures are calculated for the period under review. Some of the adjustments to these measures recommended in the literature are also included. The relationships between the measures and shareholder value are investigated. The relative information contents of the individual measures are evaluated by applying an approach similar to the one applied by Biddle *et al.* (1997: 323). The incremental information content of the components of the value based measures over the traditional financial performance measures is also investigated.

1.5 RESEARCH METHOD

1.5.1 ANALYSIS OF SECONDARY LITERATURE

A number of international and national academic publications are included in a thorough analysis of the existing literature on the subject. The objectives of the analysis of the secondary literature are to provide a summary of the theoretical backgrounds to the measures, to discuss their application and interpretation, and also to summarise the existing research focusing on the relationship between the measures and shareholder value. This is outlined in Chapters 2 and 3 of the dissertation.

1.5.2 PRIMARY RESEARCH

The objective of the primary research conducted in this study is to evaluate the information content of a number of financial performance measures. For this purpose, the measures earnings before extraordinary items (EBEI), operating cash flow (CFO), residual income (RI), economic value added (EVA), cash value added (CVA) and cash flow return on investment (CFROI) are calculated for a sample of South African firms listed in the industrial sector of the Johannesburg Securities Exchange (JSE). The study is conducted for a 15-year period from 1991 to 2005.

In order to evaluate the relative and incremental information content of the various independent variables, a similar approach to the one followed by Biddle *et al*. (1997: 311) is implemented. The different measures are included in individual regression analyses, and the adjusted R^2 values are compared. Based on these results the relative information content of the measures can be evaluated. Previous years' values are also included to evaluate the incremental informational content of a specific year's value over the previous year's value. By subdividing the various measures into their contributing components, the information content of specific components is also evaluated.

The results from the relative information content tests indicate that the value based measures are not able to outperform earnings when attempting to explain the variation in market adjusted share returns in the majority of cases investigated. Mixed results are also obtained from the incremental information content tests. It was found that although some of the components of the more complex value based measures added information content beyond that already contained in the more straightforward traditional financial performance measures, the level of statistical significance is generally low.

1.6 IMPORTANT TERMINOLOGY USED IN THE TEXT

Incremental information content indicates whether one financial measure provides additional information over and above that provided by another measure.

Inflation-adjusted financial performance measures are the financial performance measures that are calculated after the inclusion of the inflation adjustments as proposed by International Accounting Statement 15.

The **information content** of a financial performance measure refers to the additional information that the market deduces from its publication and incorporates into the expected future financial performance of the firm.

Nominal financial performance measures are the financial performance measures that are calculated without making provision for changes in the purchasing power of money.

Relative information content refers to the information content of one financial measure compared to another.

Traditional financial performance measures are those measures that do not incorporate the firm's cost of capital in their calculation, and are predominantly based on the accounting information contained in the financial statements of the firm.

Value based financial performance measures include a firm's cost of capital in their calculation, and an attempt is also made to remove some of the accounting distortions contained in financial statement information resulting from the application of GAAP.

Value based management refers to the management process where the focus is continuously placed on shareholder value maximisation.

1.7 FACTORS WHICH CONSTRAINED THE STUDY

The following factors could constrain the study:

- EVA, invested capital and cost of capital figures are obtained from the McGregor BFA database (2005). This database, however, only contains these variables for firms that are listed at the end of the research period. The values are, therefore, not available for those firms that delisted during the period under review. Excluding these firms from the study would expose it to a serious survivorship bias. Consequently, these values are estimated using the same approach as the one that is applied to calculate the values in the database. A complete example of these estimations is provided in Appendix 2.

- The research method employed in this study requires financial data for at least two consecutive years. In those cases where firms changed their financial year-end, it sometimes results in a missing value during a specific year, and it thus reduces the number of data points that can be included in this study.

  When EVA is calculated, the invested capital amount at the beginning of the financial year is also required. In order to calculate EVA values for two consecutive years, financial data for at least three years are, therefore, required.

- HOLT Value Associates, the consulting firm that promotes the measure CFROI, calculates a firm-specific discount rate that is applied to evaluate a firm's CFROI values. These firm-specific discount rates are not available from publicly available data sources, and consequently inflation-adjusted cost of capital figures are used for this purpose.

1.8 STRUCTURE OF THE STUDY

This study consists of nine chapters. **Chapter 1** contains a broad overview of the study. The background to the study, the primary and secondary objectives, the relevant hypotheses, the scope of the study, research method, important terminology, inhibiting factors and the general structure and overview of the contents of the chapters are provided.

Chapter 2 focuses on the concept of value. The chapter starts of by focusing on the value of a firm, whereafter the concept of shareholder value maximisation is addressed. A discussion of value based management, and the discounted cash flow valuation model is also provided. The prerequisites of measures of value are identified, and finally a brief discussion of the traditional financial performance measures is provided. An attempt is not made to evaluate these measures in detail; rather, the focus is placed on their limitations which lead to the development and increased popularity of the value based measures.

Chapter 3 discusses value based financial performance measures. It contains an overview of value based financial performance measures in general. The rationale behind the application of these measures, their objectives and some of their perceived benefits are highlighted. In the remaining part of the chapter the focus is placed on the three value based financial performance measures EVA, CVA and CFROI. The definitions, calculations and applications of these three measures are highlighted. An overview of the existing research focusing on the relationship between the measures and share returns is also provided.

Chapter 4 provides the research design applied for the primary analysis in the study. Standardised financial statements are obtained from the McGregor BFA database (2005) for a sample of industrial firms listed on the JSE during the period 1991 to 2005. The calculations of the measures and their contributing components that are investigated in the study are described, and examples of their calculations are provided in Appendices 2, 3 and 4. Since the database only provides the EVA values for firms listed at the end of the research period, the resulting survivorship bias is

addressed by estimating the corresponding values for delisted firms by using an approach similar to the database.

Chapter 5 contains the empirical results obtained from the evaluation of the relative and incremental information content of the measure EVA and its components.

Chapter 6 implements a number of inflation adjustments based on International Accounting Standard 15 (IAS15) and evaluates the resulting inflation-adjusted version of EVA.

Chapter 7 presents the results from the relative and incremental information content tests conducted for the measure CVA. In order to evaluate the influence of inflation on the measure, both a nominal and real version of CVA are evaluated.

Chapter 8 focuses on the measure CFROI. The results obtained from the relative and incremental information content tests of CFROI and its components are presented.

Chapter 9 provides a summary of the study's results. The main conclusions are indicated, and recommendations regarding future research are also provided.

Chapter 2

FINANCIAL PERFORMANCE MEASURES AND VALUE MAXIMISATION

2.1 INTRODUCTION

According to economic and finance theory, the major purpose of a firm is to create value. Value, however, could be considered from different points of view. A firm has different stakeholders and it needs to consider the effect of its actions on their value. In most cases firms follow an approach of shareholder value maximisation.

The concept of shareholder value maximisation is often criticised for only focusing on the financial situation of its shareholders. It is feared that this approach may result in an exploitation of the firm's other stakeholders (Barsky, Hussein & Jablonsky, 1999: 602; George, 2003: 36). Counter arguments, however, indicate that this approach indirectly results in the maximisation of the other stakeholders' value as well (Copeland, Koller & Murrin, 1994: 22).

In this chapter the concept of value is investigated. The chapter is divided into seven sections. Section one considers the value of a firm, while section two focuses on the concept of shareholder value maximisation. Section three highlights value based management. Section four introduces the discounted cash flow valuation model. Section five considers measures of value. Section six provides a brief discussion of the traditional financial performance measures. The focus is placed on the limitations of these traditional measures which lead to the development and increased popularity of the value based measures. The final section of the chapter contains a summary.

2.2 THE VALUE OF THE FIRM

According to Monks and Minow (2001: 46) corporate performance should be measured by considering the value created by a firm. The purpose of a firm is defined as long-term value creation (Monks & Minow, 2001: 34). Against this background it is possible to determine how the management of a firm should be organised to achieve this objective and how it should be motivated to ensure that it strives towards creating value. It can also be used by the shareholders of the firm to evaluate whether management has achieved this objective.

A firm has different capital providers. Shareholders contribute equity, while various capital providers supply different forms of debt capital. Since these capital providers are prepared to invest in the firm it could be argued that it has a certain responsibility towards them. Not only should management attempt to safeguard their capital contributions but it should also employ it in such a way that they are rewarded for it. When considering the value of a firm one possible approach is, therefore, to focus on the value created for all the capital providers.

A firm also has other stakeholders. Its employees, the society in which it operates, the government, the public sector and its suppliers are examples of these stakeholders. Although these stakeholders are not always directly involved in the management processes of the firm, management cannot simply ignore their situation. The effect of management actions on their well-being also needs to be considered. Failure to do so could have a negative influence on the financial performance of the firm.

The question arises on which value the focus should be placed. Should value be measured from the point of view of all the stakeholders in a firm or simply by focusing on the capital providers? Should a distinction be made between the value of the debt capital providers and the value of the shareholders?

According to Gapenski (1996: 56) some firms focus on the maximisation of their total market value. The total market value of the firm consists of the market values of its equity and debt capital. In order to maximise the firm's total market value one or both

of these components could be increased. It is important to note that this approach will not necessarily be to the benefit of the shareholders. If the additional capital invested in the firm is not invested in profitable investment opportunities it will have a negative effect on its financial performance. The maximisation of total market value should, therefore, not be deemed a firm's major objective.

In financial management theory it is generally accepted that the maximisation of the shareholders' wealth should be the major objective of a firm (Brigham & Houston, 2001: 16). It was found that by allowing the shareholder value of the firm to be maximised the other stakeholders also benefited. In the following section the approach of shareholder value maximisation is considered.

2.3 SHAREHOLDER VALUE MAXIMISATION

The concept of shareholder value maximisation has long been part of economic theory. The notion that management should maximise the value of a firm for its owners can be traced back to "The Wealth of Nations" published by Adam Smith in 1776 (Smith, 1909: 351). Shareholder value maximisation has nevertheless been criticised for focusing only on the wealth of the shareholders (George, 2003: 36; Barsky *et al.*, 1999: 602). Other stakeholders in the firm, like the employees, debt providers, the community in which the firm is based, etc, are ignored. It is argued that by focusing on only the shareholder wealth the other stakeholders may in fact be disadvantaged.

The objectives of the different stakeholders vary. Employees, for instance, may be concerned about their remuneration, job stability and working conditions. Debt capital providers, on the other hand, may be concerned about the firm's ability to meet their finance cost requirements and the repayment of their loans. Suppliers of raw materials may focus on the continued use of their products. Some of these objectives may result in a conflict of interest between the different stakeholders.

The different stakeholders are exposed to different levels of risk and their level of risk exposure normally determines their required return. Debt capital providers, for instance, are rewarded with finance costs that are based on their risk exposure. The finance cost represents a fixed and legally binding claim on the firm's profits. In the case of secured debt they may also obtain a claim on specific assets in the case of default. Employees are prepared to earn a stable salary in return for job security and a relatively low level of risk exposure.

The shareholders of a firm are normally exposed to the highest level of risk. Not only do they need to wait until all other stakeholders have been rewarded but they also have no legal claim on the profits of the firm. In order to compensate them for this high level of risk they are rewarded with voting rights in the firm based on their shareholding. This enables them to exercise control over the management of the firm.

It could be argued that this control enables them to act in a detrimental way towards the other stakeholders and that they would do everything in their power to simply maximise their own short-term shareholder value. However, the shareholders are still last in line in terms of the expected benefits created by the firm. The only profit available to the shareholders for dividends or to increase their investment in the firm is the remaining amount after all the other stakeholders have been rewarded. Consequently they also need to consider all the information with regard to the other stakeholders when making their decisions (Copeland *et al*., 1994: 27).

Not only should they focus on maximising their own wealth, but they also need to ensure that the firm is managed in such a way that sufficient profits are generated to pay all its expenses. For instance, provision needs to be made for paying finance costs to the debt providers, paying the necessary taxes to the government, and compensating the suppliers of products for the items purchased from them.

Copeland *et al*. (1994: 25) point out that it would not be feasible to disadvantage any group of stakeholders over the long term. Even though it could lead to a short-term increase in their wealth it will eventually result in a decrease of their shareholder value. In extreme cases of mismanagement it could even result in the financial failure of the firm. Examples of these actions include reducing salaries and wages, which

could lead to the loss of valuable employees and a reduction in work morale, while the failure to pay taxes will result in hefty fines. Insisting on extreme discounts from suppliers could eventually cause them to become hesitant to continue their relationship with the firm.

The idea of shareholder value maximisation is consistent with the work of Adam Smith. In "The Wealth of Nations", published in 1776, he indicates that the maximisation of the shareholder wealth eventually benefits society in general. According to Smith (1909):

> Every individual endeavours to employ his capital so that its produce may be of greatest value. He generally neither intends to promote the public interest, nor knows how much he is promoting it. He intends only his own security, only his own gain. And he is in this led by an invisible hand to promote an end, which has no part of his intention. By pursuing his own interest he frequently promotes that of society more effectually than when he really intends to promote it (p. 351).

Smith, therefore, argues that by maximising his own wealth the owner of a firm contributes to the well-being of the other stakeholders. Employees, customers, and the society in general, either directly or indirectly, benefit from the success of the firm.

Copeland *et al*. (1994: 22) report that the same concept also applies in the case of a firm that is owned by a group of shareholders. Empirical results indicate that maximising the shareholders' value does not disadvantage the other stakeholders. In fact, successful firms appear to generate greater value for all their stakeholders.

According to Copeland *et al*. (1994: 22) the following factors also support the implementation of a system that focuses on shareholder wealth:

- *Value is the best measure of performance available*. Most traditional performance measures tend to be one-dimensional and usually focus on only a specific aspect of a firm's performance. Value, however, focuses on all the aspects relevant to the future financial performance of the firm and requires complete information.

- *The shareholders are the only stakeholders who will focus on maximising the value of all the stakeholders*. Copeland *et al*. (1994: 25) propose that the other stakeholders in a firm usually focus only on those aspects that have an influence on their own value. Allowing the debt providers, for instance, to maximise their value could result in extremely high finance costs. This would disadvantage all the other stakeholders since the payment of finance costs are usually legally enforceable.

  Shareholders, on the other hand, are forced to interpret all information with regard to the firm. Furthermore, they are only rewarded after all the other stakeholders have been compensated.

- *Capital will eventually be withdrawn from firms that do not maximise their value*. Investors require a return on their investment that will compensate them for the risk to which they are exposed. According to Copeland *et al*. (1994: 27) investors will transfer their investment to another opportunity that does offer their required return if a firm is unable to provide this return. Firms failing to maximise their shareholder value could eventually find themselves in a position where they are unable to attract capital.

Over the last two decades the focus of firms has been directed towards the notion of value creation. Young and O'Byrne (2001: 5) ascribe this to the following changes:

- An increased level of globalisation and deregulation in capital markets;
- The end of most capital and exchange control systems;
- Highly liquid securities markets;
- Advances in information technology;
- Improvements in the regulation of capital markets;
- A change in investors' attitude towards savings and investments;
- Increases in the size of the institutional investors.

As a result of these changes capital providers are able to move their investments between different investment opportunities with relative ease. The number of investors also increased considerably. Consequently firms need to place more emphasis on their capital position than before. Failure to do this will result in a higher cost of capital (Young & O'Byrne, 2001: 8). This exposes the firms to the risk of takeover activities, or in extreme cases, financial failure. Unless the firms are able to offset the higher capital cost with greater operating performances they will not be able to remain competitive.

Martin and Petty (2000: 4) indicate that some firms attempt to solve the conflict between the different stakeholders by not focusing on shareholder value maximisation. As a result, these firms ultimately end up destroying shareholder value.

2.3.1 THE AGENCY ISSUE

Ensuring that a firm always attempts to maximise shareholder value is difficult. One of the major problems experienced is referred to as the Agency Issue. Since it is impossible for all the different stakeholders to be directly involved in the management of a firm managers need to be appointed. As a result of the consequent corporate structure the shareholders lose some of their control over the firm (Monks & Minow,

2001: 3). Since management are required to make decisions on behalf of the shareholders a potential conflict of interest may arise (Brigham & Houston, 2001: 21).

This problem has been present for a considerable period of time. It is mentioned as follows by Adam Smith (1909) in "The Wealth of Nations":

> The directors of such companies, however, being the managers rather of other people's money than of their own, it cannot be well expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own. Like the stewards of a rich man, they are apt to consider attention to small matters as not for their master's honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company.

According to Jensen and Meckling (1976: 306) a manager of a firm will engage in activities that would not necessarily lead to the maximisation of its shareholders' value. In order to ensure that these types of actions are limited the shareholders of a firm need to implement systems that monitor management. The costs of these types of actions are referred to as agency costs.

They argue that by incurring monitoring costs it is possible to reduce the agency cost, since it will reduce management spending that is not adding to the value of the firm (Jensen & Meckling, 1976: 323). In order to monitor management, however, it is important to have a clear understanding of the relationship between the reported financial performance of a firm and its shareholder value creation. It would, therefore, be beneficial to identify those performance measures that have a strong relationship with shareholder value, since these measures could be employed when monitoring the firm's management. By identifying the relevant financial performance measures, a decrease in the monitoring costs required could be achieved.

2.4 VALUE BASED MANAGEMENT

Copeland *et al*. (1994: 127) define Value Based Management (VBM) as the process of continuously maximising the value of a firm. According to them shareholder value creation is the main objective when applying VBM techniques. They argue that VBM is based on discounted cash flow (DCF) concepts (Copeland *et al*., 1994: 93). The value of the firm is determined by the present value of its future cash flows. Investing in projects where the return exceeds the cost of capital results in value creation, while investing in projects with returns below the cost of capital destroys value.

Young and O'Byrne (2001: 468) indicate that it is important to realise that the value of a firm is eventually determined by capital markets' perception of its ability to generate future cash flows. They point out that when a VBM approach is adopted the future cash flows, as well as the cost of capital, of all investment opportunities should be carefully scrutinised. The interpretation of cash flow figures when used to evaluate historical financial performance, however, should be carefully conducted. Negative cash flows are not necessarily an indication of poor financial performance but may be the result of large investments required to generate future cash flows.

According to Copeland *et al*. (1994: 97) VBM is a combination of two elements. On the one hand, it consists of adopting a value-creation mindset throughout a firm. Each employee should understand that the financial objective is to maximise the value of the firm. They should understand that all their actions should be directed towards achieving this objective.

They also indicate that this value-creation mindset should be combined with the necessary management processes and systems to ensure that the employees would actually behave in a manner that creates value (Copeland *et al*., 1994: 98). Important factors to consider include the performance measures applied to evaluate employees, targets set, as well as the necessary incentive systems. Employees need to know exactly what targets they are trying to achieve.

Furthermore, employees should know how their performance will be evaluated. It is very important that the performance measures adopted should support the targets declared by the firm. In order to ensure that employees focus on the creation of shareholder value their performance need to be evaluated and rewarded in terms of the shareholder value created. A VBM system should thus ensure that employee compensation is linked to value based financial performance measures (Martin & Petty, 2000: 6).

Martin and Petty (2000: 9) consider the following three elements to be decisive in order to successfully implement a VBM system:

- *The program must be supported by the top management of the firm*. Without the support of top management the implementation of a VBM system will prove to be difficult. Top management should ensure that the program is implemented at all levels and in all the divisions of the firm. They should also continue to focus on its objectives at all times.

- *A link between the performance and compensation of managers should be implemented*. In order to motivate managers to strive towards the objectives of the VBM system they should be rewarded for achieving it. Compensation systems should focus on the performance required under the VBM system and managers should be rewarded accordingly.

- *The VBM system should be understandable to all levels of employees.* To ensure that the VBM system is implemented successfully in all divisions of the firm it is of great importance that all employees should understand it. Performance measures should be developed that are understandable and suitable for the different divisions. This may entail translating the performance measures into divisional value drivers.

An important aspect with regard to the success of VBM systems is raised by Martin and Petty (2000: 200). Although VBM systems appear to be implemented successfully they argue that the following factors also need to be considered:

- *The accuracy of share price estimates obtained from discounted cash flow models*. Martin and Petty acknowledge that although DCF methods provided reasonably accurate share price estimates, large prediction errors do occur. Since VBM methods are based on DCF methods these methods may be exposed to the same inaccuracies.

- *The ability of the VBM measures to predict the market value of a firm's shares*. DCF methods estimate the value of a firm by calculating the present value of the expected future cash flows. Most of the VBM measures applied, however, are single-period performance measures. Martin and Petty indicate that the ability of these single-period measures to estimate share values could be questionable.

- *The effect of the implementation of a VBM system on the performance of a firm*. Martin and Petty (2000: 201) also question the long-term sustainability of a VBM system. They indicate that although it could be possible to improve the financial performance of a firm over the short-term it could become increasingly difficult to maintain this improvement over the long-term. Amongst others they refer to studies that report no statistically significant differences in the performances of firms applying VBM systems and those that do not over the long-term.

2.5 DISCOUNTED CASH FLOW ANALYSIS

For a firm to focus on the maximisation of shareholder value it is necessary to import a financial management system that would ensure that all levels of the firm engage in activities that will result in the creation of value. Applying DCF principles could ensure that this is achieved. According to Copeland *et al.* (1994: 22) this approach

has an extremely strong correlation with market value. They perceive it to be a superior measure of value since complete information is required when applying it to calculate the value of a firm. Not only are all future cash flows included in its calculation, but they are also evaluated on a risk-adjusted basis.

Under a DCF approach the expected future cash flows of the firm are estimated and discounted at an applicable discount rate. The discount rate reflects the time value of money, as well as the risk of the cash flows (Young & O'Byrne, 2001: 22).

Translating the DCF principles into value creating actions is usually accomplished by applying the NPV technique when evaluating investment opportunities. Projects with positive NPV contribute to the shareholder value of the firm, while negative NPV projects result in a destruction of shareholder wealth (Young & O'Byrne, 2001: 25).

2.6 MEASURES OF VALUE

One of the problems that management may face is to determine which measure should be used to evaluate and value corporate performance and value creation. According to Obrycki and Resendes (2000: 158) an ideal performance measure should not only focus on the financial performance of a firm, but should also provide an indication of what it is worth. The correlation between such a measure and the firm's market value should consequently be high. But in practice this is not always the case. A number of studies report that the majority of the accounting based performance measures exhibit weak correlations with market values (Black *et al*., 2001: 51; Obrycki & Resendes, 2000: 158).

According to Peterson (2000: 95) a performance measure should meet the following criteria:

- *The effects of different accounting methods should be removed*. The reported financial performance of a firm could be greatly influenced by its choice of accounting method. An ideal performance measure should thus aim to remove the effect of different accounting methods. This promotes the comparability of the measure between different firms.

- *The measure should be future-orientated*. In order to evaluate management's decisions the expected future results of these decisions should be investigated. It is not sufficient to consider the historical financial performance of the firm and to assume that it will necessarily continue in future.

- *The measure should incorporate risk*. Different projects expose a firm to different levels of risk. In order to facilitate the comparison between the different projects a performance measure should make provision for risk. The same concept also applies to the comparison of different firms. Consequently an ideal performance measure should incorporate risk in its calculation.

- *Uncontrollable factors should be excluded from the measure*. Factors not under the influence of the management of a firm should not be reflected in a performance measure. Examples of these factors include general market movements, changes in a firm's regulatory requirements, and economic changes. Since management cannot influence these factors it should be excluded from the performance measures applied to evaluate their performance.

Young and O'Byrne (2001: 34) also identify the following factors that performance measures need to address:

- *The measures should be calculable at the divisional level*. In order to ensure that the measures are understandable to employees on all the levels of the firm it is important that they can be translated to the divisional level. If it is not possible to calculate the measure within a division alternative measures that will support it need to be defined. Some firms also transform performance measures into value drivers that may be easier to interpret and apply at the divisional level.

- *The measures should be flow measures*. To evaluate a firm over time it is important to apply a flow measure. Flow measures are calculated for a certain period of time, while stock measures evaluate the firm at a specific point in time. Since value creation is a long-term process applying flow measures are more suitable that stock measures.

- *The measures should promote the creation of shareholder value*. Since the objective of a firm is to maximise its shareholders' value the performance measures applied within it should contribute to the achievement of this objective. Implementing a performance measure that is not focused on the creation of shareholder value may result in the opposite being achieved.

A considerable number of measures have been developed to value corporate performance. While most of the traditional measures attempt to evaluate the financial performance of a firm they are often criticised for failing to consider value creation. Value based performance measures are often proposed as an improvement on the traditional measures, since they focus both on financial performance as well as the value created by a firm.

In the following section of this chapter an overview of the traditional financial performance measures are provided. The major arguments against the use of these

measures when evaluating shareholder value creation are highlighted. Based on these perceived limitations, the focus is placed on the value based measures in Chapter 3.

2.7 TRADITIONAL PERFORMANCE MEASURES

Financial performance measures provide a valuable tool to the different stakeholders of a firm. Internally these measures may be utilised by the management and existing shareholders to evaluate the past financial performance and the current financial position of a firm. Alternatively, it can also be used by potential shareholders and financial analysts to predict future financial performance (Brigham & Houston, 2001: 89).

Yook (1999: 36) and Yook and McCabe (2001: 77) point out that traditional accounting measures are often criticised because they are not able to guide a firm's strategic decisions in such a way that shareholder value is maximised. Mixed results are obtained when evaluating the ability of these traditional performance measures to quantify shareholder value creation. In some studies little or no relationship between traditional accounting measures and future share performance is reported (Black *et al*., 2001: 51; Obrycki & Resendes, 2000: 158; Copeland *et al*., 1994: 77). In other studies these measures are found to provide valuable information regarding expected performance (Peterson & Peterson, 1996: 45). Mixed results are also obtained when comparing the ability of the traditional measures to predict share prices with that of the value based measures (Peterson & Peterson, 1996: 38; Young & O'Byrne, 2001: 431).

It is argued that the traditional measures of financial performance, such as earnings, cash flow values, various profitability, turnover, liquidity and solvency ratios, etc, are not suitable as measures of value creation in general. In most cases they are single-period measures. Furthermore they are based on accounting figures, exposing them to the distorting effects of GAAP.

According to Martin and Petty (2000: 8) these traditional measures are exposed to two major weaknesses:

- *They exclude the opportunity cost of the capital invested in the firm.* Only the cost of the debt capital is included in their calculation while the cost of the shareholders' equity is ignored.

- *The measures are calculated by considering historical values.* There is no guarantee that these values provide an accurate indication of the expected future performance of the firm.

Numerous criticisms against the use of the traditional financial performance measures have been reported. One of the major criticisms levied against the use of these measures is that they are based on accounting data (Ehrbar, 1998: 80; Peterson & Peterson, 1996: 10). These accounting figures may not be an accurate indication of the actual financial situation of a firm. For instance, the accounting values of property, plant and equipment may be distorted as a result of inflation and may not represent their current replacement value.

The valuation and inclusion of intangible assets (including items like goodwill, patent rights and licenses) in financial statements also presents a problem when evaluating a firm. When calculating and interpreting financial performance measures it is consequently of great importance that the possible influence of different accounting methods should be considered.

It is also possible to manipulate accounting figures in such a way that they provide a false indication of a firm's actual financial position (Young & O'Byrne, 2001: 431; Obrycki & Resendes, 2000: 158; Stern, Stewart & Chew, 1995: 33).

Peterson and Peterson (1996: 10) also criticise the application of predominantly historic accounting data to explain current and future share prices. For certain firms there may be absolutely no relationship between these historic items and their ability to generate future profits. For instance, if a firm is applying relatively old equipment in its production processes these items may be shown at very low carrying (book)

values while still providing a major contribution to its revenues. Calculating a financial performance measure based on this questionable value could provide the analyst with an inaccurate impression of the firm's performance.

One of the most popular traditional performance measures is the earnings per share (EPS). This measure is used extensively, both internally and externally, as a proxy for the financial success of a firm over a specific period of time. Management compensation is often linked to the EPS achieved by a firm. Investors also seem to value the informational content of the measure (Stewart, 1991: 35; Ehrbar, 1998: 41).

When valuing a firm the discounted value of all its expected future cash flows is normally considered. Accounting earnings, however, does not represent the expected future cash flows generated by a firm. Instead, it considers the historical earnings generated by the firm. As a result, the maximisation of a firm's EPS does not necessarily result in the maximisation of its share value (Martin & Petty, 2000: 8).

Additional problems associated with the traditional measures identified by Martin and Petty (2000: 36) include that they are not cash flow values, they do not incorporate the risk of a firm's activities, they do not focus on the time value of money, and that the value of a measure may differ from firm to firm due to different accounting practices being applied.

2.8 SUMMARY

In this chapter concepts relevant to value maximisation and financial performance measures were addressed. The purpose of any firm is defined as the long-term creation of value. Although different stakeholders are associated with a firm a number of studies are of the opinion that the maximisation of the shareholders' value benefits them all. Based on these results shareholder value maximisation is proposed as the main objective of a firm. In the second part of the chapter the background to this approach was discussed. The conflict of interest that may arise between the

management and the shareholders of the firm was also explained by considering the agency issue.

VBM was proposed as a management system that promotes the maximisation of a firm's value and is considered to be consistent with the objective of shareholder value maximisation. In this chapter the important factors that need to be considered when implementing a VBM system were identified.

When evaluating the value creating potential of a firm the DCF technique is considered the most suitable. According to this technique the expected future cash flows of a firm are discounted at a risk-adjusted discount rate. The resulting value provides an estimate of the firm's value. Studies were identified indicating that this technique is strongly correlated with market values and that it is similar to the evaluation approaches followed by the market.

Developing performance measures that could be applied to evaluate financial performance and shareholder value creation is of great importance. Traditional measures of performance fail to include the firm's cost of capital in their calculations, and appear to focus exclusively on the use of historical accounting information in an attempt to quantify financial performance. If the relationship between the traditional measures and shareholder value is considered, mixed results are also obtained.

The need for performance measures that also consider the value creating potential of a firm led to the development of the value based performance measures. These measures attempt to link the financial performance of a firm with the shareholder value it created. This is achieved by including the opportunity cost of the capital invested in the firm. In the next chapter of this study, the value based financial performance measures will be discussed. Some of the most popular value based measures will also be identified.

Chapter 3

VALUE BASED FINANCIAL PERFORMANCE MEASURES

3.1 INTRODUCTION

The main objective of a firm's management should be to maximise its shareholders' value. Since the expected financial performance of a firm impacts on its future share price it is important to be able to evaluate its financial performance effectively. Translating management actions and the resulting financial performance of the firm into its expected future share returns may, however, prove to be a major problem. A large number of different financial performance measures have been developed in an attempt to address this dilemma. Some empirical studies question the ability of these traditional measures to link the financial performance of a firm with share returns (see, for instance, Black *et al*., 2001: 51).

Over the last two decades a shift has occurred from the more traditional performance measures to the so-called value based performance measures. These measures attempt to link the financial results of a firm with the shareholder value created (Stewart, 1994: 74; Sheehan, 1994: 85). Proponents of these measures argue that they provide an improvement over the more traditional measures (Lehn & Makhija, 1996: 34).

In this chapter value based financial performance measures are discussed. The chapter is divided into five sections. Section one contains an overview of value based performance measures. The rationale behind the application of these measures, their objectives and some of their perceived benefits are highlighted. The next three sections focus on different value based measures. In section two the measure economic value added (EVA) is discussed. Section three introduces the measure cash

value added (CVA), while section four focuses on the measure cash flow return on investment (CFROI). The definitions, calculations and applications of the three measures are highlighted. An overview of the existing research focusing on the relationship between the measures and share returns is also included in each section. The final section provides a summary.

3.2 VALUE BASED PERFORMANCE MEASURES

Value based financial performance measures are presented by their proponents as a major improvement over the traditional performance measures. Most importantly, by including a firm's cost of capital in their calculation it is argued that they could be applied in order to evaluate the value creating potential of a firm (Young & O'Byrne, 2001: 431; Lehn & Makhija, 1996: 35). If the returns generated on a firm's projects are in excess of its cost of capital these projects would yield positive net present values and consequently shareholder value is increased (Grant, 2003: 81; Stewart, 1991: 174). It is also proposed that these value based measures attempt to overcome some of the problems associated with the traditional measures by removing the accounting distortions contained in financial statement information (Ehrbar, 1998: 80; Peterson & Peterson, 1996: 10; Stewart, 1991: 66).

Over the past two decades value based financial performance measures have experienced a large increase in popularity. Obrycki and Resendes (2000: 158) consider the following two factors as possible reasons for this increase in popularity:

- *Capital providers require an adequate return on their investments.* The management of a firm is, therefore, forced to consider the capital invested in the firm under its control very carefully. Since the traditional measures do not incorporate the cost of capital in its calculations, other measures had to be identified.
- *The link between accounting figures and market values are not clear.* Considering only accounting figures in an attempt to explain market

values provides poor results. It is also difficult to compare accounting figures between different firms.

According to them the objectives of the value based performance measures are the following:

- To remove the effects of accounting distortions when calculating financial performance measures.
- To evaluate the corporate performance of a firm as well as the performance of management.
- To be used in the valuation of the firm.

The major proposed benefit of the value based performance measures above the traditional measures is that they attempt to calculate the economic profit, rather than the accounting profit, of a firm (Peterson & Peterson, 1996: 31). In order to achieve this they incorporate an element that compensates the shareholders for the capital that they provided. While accounting profits are calculated as the difference between receipts and expenses matched according to GAAP guidelines, economic profits consider the difference between the operating profit and the cost of the capital employed in generating those profits. Accounting profits thus exclude the cost of equity capital and may be overstated.

Another perceived benefit is that by including accounting adjustments in their calculations, these measures attempt to remove the effect of accounting distortions from the financial statement data (Young & O'Byrne, 2001: 205). When calculating CFROI, for instance, the property, plant and equipment (PPE) amount is inflation-adjusted to make provision for the higher replacement value of the item.

A large number of different value based performance measures have been developed. According to Lehn and Makhija (1996: 34) one of the problems in evaluating these measures is that relatively little independent research has been conducted on their ability to measure shareholder value creation. The results of the different studies also exhibit large variations in their conclusions. It is consequently not clear whether these

value based measures are able to outperform the traditional financial performance measures when attempting to explain share returns.

In the remainder of this chapter three commonly applied value based financial performance measures, namely economic value added, cash value added, and cash flow return on investment are highlighted. The reason why this study focuses on these three measures is that it is possible to calculate them based on publicly published financial information. Some of the other value based measures require information that is not available in the public domain, and consequently, it would not be possible to calculate these measures.

3.3 ECONOMIC VALUE ADDED

3.3.1 INTRODUCTION

Perhaps one of the most well-known value based performance measures is Economic Value Added (EVA). This measure, which was registered and trademarked by the New York based consulting firm Stern Stewart and Co., has been adopted by a number of the world's largest firms. It enjoys huge media exposure in the popular press and numerous examples of successful implementations by companies are available (Walbert, 1993: 64; Teitelbaum, 1997: 265). A number of studies questioning the benefits achieved by implementing EVA, however, have also been conducted. These studies dispute some of the claims made by EVA proponents.

In this part of the chapter the measure EVA will be investigated. Section 3.3.2 provides a definition of EVA, while section 3.3.3 focuses on the historical development of the measure. The calculation of the measure is outlined in section 3.3.4, and the link between EVA and the NPV of the firm is investigated in section 3.3.5. Finally, the results of empirical studies conducted on the relationship between EVA and shareholder wealth created are provided in section 3.3.6.

3.3.2 DEFINITION OF EVA

According to Stewart (1994: 73) EVA is an estimate of the economic profit generated by a firm. The difference between an economic and an accounting profit is a capital charge that is levied on the capital provided to the firm. In the case of an accounting profit only the cost of debt capital is included. EVA, however, considers the costs of all its forms of capital (debt, as well as equity) (Grant, 2003: 2) and compensates all its capital providers accordingly.

Stewart (1991: 137) indicates that EVA is another form of residual income (RI). Both EVA and RI are determined by calculating the difference between operating profit and a capital charge. Alternatively, the difference between the return on and the cost of a firm's capital is considered. Multiplying this difference by the invested capital yields the economic profit. The difference between EVA and RI, however, is that a number of proprietary accounting adjustments are incorporated in the calculation of EVA.

EVA is based on the concept that shareholder wealth can only be created if a firm earns a return on its capital that exceeds its cost of capital. If this can be achieved, the total shareholder value increases, while failure to do so results in shareholder wealth being destroyed.

According to Stewart (1994: 73) EVA differs from accounting profits in three ways:

- It is the residual income, calculated by subtracting the firm's cost of capital.
- A capital charge based on the risk-exposure of the firm is included to compensate investors for their investment.
- Accounting figures are adjusted to remove possible distortions caused by GAAP.

In order to increase a firm's EVA, Stern, Stewart and Chew (1995: 40) and Young and O'Byrne (2001: 68) propose that one or a combination of the following methods could be applied:

- *By earning increased returns on the existing capital provided to the firm.* If a firm is able to increase its profitability while still utilising its existing invested capital it will generate additional EVA. This, for instance, can be achieved by a greater turnover rate of its assets.

- *Additional capital investments in projects where the expected return is greater than the cost of capital*. By investing more capital in profitable projects a firm will also be able to increase its EVA. Although the additional investments will increase the capital charge it will be offset by a return that exceeds the cost of capital.

- *Divestment of projects where the return is less than the cost of capital*. By divesting from projects where insufficient returns are generated to cover the cost of capital the amount of invested capital will be reduced. This will result in a decrease in the capital charge and an overall increase in EVA.

- *Ensuring longer periods where the return on capital is greater than the cost of capital*. If the lifetime of profitable projects can be extended, a greater amount of EVA can be created.

- *Reducing the cost of capital*. By reducing the cost of capital a lower capital charge need to be covered, resulting in a larger amount of EVA.

3.3.3 HISTORICAL DEVELOPMENT OF THE MEASURE

3.3.3.1 ECONOMIC PROFIT

According to the basic concept on which EVA is based a firm can only create value for its shareholders (i.e. add economic value) if it earns a return on its capital in excess of its cost of capital. This concept, however, has been part of economic theory for many years and appeared in early economic literature by Hamilton (1777) and Marshall (1890).

Marshall (1890) states the following:

> What remains of his profits after deducting interest on his capital at the current rate, is generally called his earnings of undertaking or management. (p.142)

When calculating the value added by a firm it is, therefore, not sufficient merely to match the receipts and expenses for a given period (i.e. the normal accounting profit). Provision also needs to be made for the opportunity cost of the capital (Grant, 2003: 3). Marshall makes no distinction between the cost of equity and debt capital. One of the major differences between the normal accounting profit and economic profit is thus that the capital charge does not only consider debt capital (the finance cost subtracted in an income statement), but also includes a cost of equity component.

According to Copeland *et al*. (1994: 145) this economic theory forms the basis for economic profit. Economic profit may be applied to measure the value created by a firm. Profits in excess of a firm's cost of capital result in positive economic profits and value is created, while a deficit results in the destruction of value.

The concept of economic profit has been translated into numerous financial performance measures. Examples of these measures include abnormal earnings, excess earnings, excess income, excess realisable profit, and super profits (Biddle *et*

al., 1997: 302). All of these measures are similar since they all make provision for a charge on the capital employed by a firm.

3.3.3.2 RESIDUAL INCOME

Another example of a measure based on economic profit is residual income (RI). This measure is defined as the difference between a firm's accounting profits (usually the operating profit after tax (Biddle *et al*., 1997: 302)) less a capital charge. The capital charge is calculated by multiplying the book value of the firm's assets with its weighted average cost of capital (WACC) (Bromwich & Walker, 1998: 391). The WACC incorporates the cost of equity and the cost of debt capital. The major difference between EVA and RI is the accounting adjustments included in the calculation of EVA. RI considers only the accounting figures and no attempt is made to remove the possible distorting effect of GAAP accounting.

A measure similar to RI has been applied by General Motors as early as the 1920s (Stern Stewart EVA Roundtable, 1994: 54). The term residual income was also used by General Electric in the 1950s and applied to evaluate divisional performance and executive compensation (Biddle *et al*., 1997: 302). In 1965, David Solomons also discusses the measure of RI (Stern Stewart EVA Roundtable, 1994: 53).

Egginton (1995: 203) reports that one of the advantages of applying RI in the valuation of a firm is that it is consistent with NPV criteria when evaluating investment decisions. Under a set of (limiting) assumptions the present value of a firm's RI values over its entire lifetime should be equal to its NPV. In a number of empirical studies, however, he found that this was not always the case.

Egginton (1995: 201) considers the measurement of depreciable assets as one of the main problems experienced when calculating RI. In those cases where the simplest form of depreciation (straight-line depreciation) is applied, RI values are inconsistent with NPV (Egginton, 1995: 207). For other forms of depreciation, however, this is not necessarily the case.

Another problem experienced with RI is the accounting data used to calculate it. The profit and capital amounts included in the calculation are obtained from the firm's financial statements, and as such, may not be an accurate indication of the items' true values. Martin and Petty (2000: 45) also indicate that the measure may yield unsatisfactory values in those cases where large expenditures on research and development (R&D) were made. They ascribe this to the inclusion of the full expenditure amount in the calculation of the current year's operating profit although the expected benefits of these R&D expenditures may only be realised in the future.

3.3.3.3 EVA

Goldberg (1999: 57) considers EVA in its simplest form to be another version of RI. The major difference between EVA and RI is the proprietary accounting adjustments included in the calculation of EVA. These adjustments are included in an attempt to remove the distorting effects of GAAP on financial statement information.

EVA was developed and introduced by the New York based consulting firm of Stern Stewart and Co. during the early 1980s. The company trademarked the measure and has been aggressively marketing it for the past two decades. During this time it has enjoyed increased popularity. Numerous examples of large firms that successfully implemented EVA are published (Teitelbaum, 1997: 265; Walbert, 1993: 64).

In their marketing, Stern Stewart places a strong emphasis on the advantages of adopting and implementing EVA. Studies published in the Journal of Applied Corporate Finance (published by Stern Stewart Management Services) focus almost exclusively on supporting the measure. According to these studies, one of the major benefits associated with EVA is the strong relationship between a firm's EVA and shareholder returns (Stewart, 1994: 74). Maximising a firm's EVA should consequently result in an increase in shareholder value created (Stewart, 1991: 174).

3.3.4 CALCULATION OF EVA

EVA is determined by calculating the difference between the cost of a firm's capital and the return earned on capital invested, and multiplying it with the amount of capital invested in the firm (Young & O'Byrne, 2001: 46):

$$EVA_t = (r - c^*) \times IC_{t-1} \quad (3.1)$$

where:

r = the return on the capital invested
c^* = the firm's after-tax cost of capital
IC_{t-1} = the invested capital at the beginning of period *t*

As can be seen from Equation 3.1, EVA quantifies the surplus return earned by the firm. In those cases where a firm is able to earn a return that is higher than its cost of capital a positive value for EVA is calculated. A negative EVA value is calculated when the cost of capital exceeds the return on the invested capital.

Alternatively, the measure can be calculated by comparing the net operating profit after tax with the total cost of capital invested.

$$\begin{aligned} EVA_t &= NOPAT_t - \text{Total cost of capital invested} \\ &= NOPAT_t - (c^* \times IC_{t-1}) \end{aligned} \quad (3.2)$$

where:

$NOPAT_t$ = Net operating profit after taxes

If a firm is able to earn NOPAT values in excess of its total cost of capital invested it generates a positive EVA figure. However, should NOPAT be insufficient to cover the firm's total cost of capital, a negative value for EVA is calculated.

The rationale behind the calculation of EVA is that shareholder value can only be created in those cases where a firm can reward all relevant parties (shareholders and debt providers) for the capital they provided. This means that sufficient profits need to be available to cover the costs of capital, and that surplus profits (if any) are available to increase the shareholder value. If a firm is not able to cover the costs of capital no surplus profits would be available to increase shareholder value.

In the following sections, the different components included in the calculation of EVA are discussed in more detail.

3.3.4.1 CAPITAL INVESTED

The invested capital amount includes all the capital provided to the firm, except the short-term non-interest bearing borrowings (Young & O'Byrne, 2001: 43). Items included under short-term non-interest bearing borrowings are trade payables, tax payable, dividends payable, etc. Even though some of these items may have a cost associated with them (trade payables, for instance, could have an indirect cost as a result of cash discounts forfeited), the cost and effort required to determine it may be too high. Consequently they are excluded.

When calculating the capital invested a number of accounting adjustments are suggested. These adjustments are considered in section 3.3.4.5 of this chapter.

3.3.4.2 NOPAT

The NOPAT figure included in the calculation of EVA is determined as follows (Young & O'Byrne, 2001: 54):

Revenue
- Cost of Sales
- Selling and operating expenses
= Operating profit before tax
+ Interest received
- Tax
- Tax benefit on finance cost
= NOPAT

(3.3)

Interest received is included in the calculation of NOPAT, since the invested capital amount includes cash. Cash is exposed to a capital charge and the interest received on the cash should, therefore, be included in the calculation of EVA (Young & O'Byrne, 2001: 57).

The tax benefit on the finance cost results from subtracting the finance cost paid when calculating tax in the income statement. The tax amount subtracted above is calculated after finance cost was included in the operating profit before tax. Since finance cost is not included in the NOPAT calculation, this benefit is excluded from the figure (Young & O'Byrne, 2001: 57). The reason why finance cost is not included in the calculation of NOPAT is to separate the firm's operating performance from its method of financing (O'Byrne, 1999: 92). It is important that the unleveraged value of NOPAT should be included in the calculation of EVA. The tax benefit on the finance cost is calculated by multiplying the finance cost amount with the firm's marginal tax rate.

3.3.4.3 COST OF CAPITAL

The firm's cost of capital is usually determined by calculating its WACC. This figure includes the after-tax cost of equity, as well as the after-tax cost of the different forms of debt. Weighting the different costs according to their contribution to the firm's total capital yields the WACC (Stewart, 1991: 434).

- ***COST OF DEBT***

The cost of debt is the rate that the firm would need to pay when obtaining new long-term debt capital (Stewart, 1991: 434). The current yield to maturity of the firm's debt could be used to determine this figure. Alternatively, it can be approximated by determining the rate paid by firms with the same bond rating.

- ***COST OF EQUITY***

The cost of equity represents the opportunity cost of the firm's equity providers. It is relatively difficult to estimate this cost and presents one of the major challenges when calculating EVA (Young & O'Byrne, 2001: 470; Ehrbar, 1998: 180). A number of methods may be applied to estimate the cost of equity. According to Young and O'Byrne (2001: 185) the approach normally used to estimate the cost of equity for EVA calculations is based on the Capital Asset Pricing Model (CAPM).

This model, developed by Sharpe, Lintner and Black, attempts to explain the expected return required by investors. It incorporates a measure of an investment's systematic risk (indicated by the beta), the risk-free return available to investors, as well as the excess return the investment offers above the risk-free rate.

Yook (1999: 35) suggests that the expected return required by an investor, $E(R_i)$, can be calculated by applying the following model based on the CAPM:

$$E(R_i) = R_f + \beta_i (R_m - R_f) \qquad (3.4)$$

where:

R_f = the risk-free return, usually estimated by the return on long-term government bonds

$(R_m - R_f)$ = the equity market risk premium

β_i = the beta of firm i's shares, a measure of the firm's systematic risk

When applying this measure to a firm its expected cost of equity is represented by $E(R_i)$. This represents the return investors could earn on investments exposing them to the same amount of risk.

The CAPM, however, is heavily criticised. The most compelling arguments against the model were published by Fama and French during the 1990s. According to their studies, the relationship between beta and average stock returns is relatively weak, seriously questioning the suitability of applying the CAPM to determine the cost of equity (Fama & French, 1992; 1993).

In an attempt to overcome the limitations of the CAPM, the Arbitrage Pricing Model (APM) was developed. Young and O'Byrne (2001: 185), however, indicate that most EVA proponents continue to estimate the cost of capital by applying the CAPM since a number of problems were also identified for this model.

3.3.4.4 RETURN ON CAPITAL

In order to calculate EVA the return on the invested capital is compared to the cost of capital (as measured by the WACC). The return on the invested capital is calculated as:

$$ROIC_t = NOPAT_t / IC_{t-1} \quad (3.5)$$

where:

$ROIC_t$ = The return on the firm's invested capital

The IC_{t-1} and $NOPAT_t$ figures are the ones described in sections 3.3.4.1 and 3.3.4.2 respectively.

3.3.4.5 ACCOUNTING ADJUSTMENTS

The formulae for the calculation of EVA appear to be straightforward. The measure as proposed by Stern Stewart, however, requires a number of accounting adjustments that need to be included. These adjustments are completed to adjust for accounting distortions resulting from GAAP. According to Stewart (1994: 73) a total of up to 164 adjustments are available.

In most cases, however, not all of these adjustments are relevant and only a small number will be performed. For an average firm about 25 adjustments are normally considered, while as few as five to ten are usually implemented (Stewart, 1994: 74; Stern *et al*., 1995: 41). In a study investigating the way that EVA proponents calculate the measure Weaver (2001: 58) reports that the number of adjustments vary between the different firms included in his survey. An average of 19 adjustments with a range between seven and 34 adjustments were observed.

According to Martin and Petty (2000: 90) the reasons for the adjustments are:

- The conversion from accrual accounting profit figures to cash figures.
- The capitalisation of past expenditures incurred to increase the firm's market.
- The conversion from successful efforts accounting to full-cost accounting.

The inclusion of a large number of accounting adjustments during the calculation of EVA increases the complexity of the measure. Young (1999: 18) questions the advantages of these adjustments and concludes that in most cases users of the measure will gain few advantages above unadjusted accounting figures by including them. According to him the less complex measure RI will offer almost all of the benefits contained in EVA.

Keys, Azamhuzjaev and Mackey (2001: 67) also identify a number of weaknesses and limitations associated with the EVA adjustments. According to them Stern Stewart's definitions of the invested capital and NOPAT figures include a number of

inconsistencies. They recommend that firms should rather use a variant of RI or another measure in order to evaluate short-term financial performance. Chen and Dodd (1997: 331) and Keef and Roush (2003: 252) also conclude that RI offers all the benefits of EVA, but without the complex adjustments.

Some of the major EVA accounting adjustments suggested by Stern Stewart will now be discussed in greater detail.

- ***RESEARCH AND DEVELOPMENT***

According to GAAP guidelines research and development (R&D) costs should be subtracted in the income statement as an expense in the period where they were incurred. This treatment of R&D severely penalises firms with a strong emphasis on research. Subtracting (relatively large) amounts of R&D expenses have a negative effect on profitability, and if left unadjusted, it will reduce EVA. This could result in managers reducing their R&D expenses during difficult years, at the disadvantage of the firm (and its shareholders) over the long-term.

According to Stern Stewart (Ehrbar, 1998: 168) these R&D expenses should be capitalised and amortised over an appropriate period of time. The full capitalised amount is included in the balance sheet as an asset (which is expected to generate future returns) while an annual charge (calculated over the amortisation period) is subtracted in the income statement.

Allowing for this adjustment has a number of advantages. As mentioned already, managers would not be penalised for incurring necessary R&D and will thus not be tempted to reduce these costs simply to increase profits. R&D expenses would not have an immediate effect on EVA. The amortisation in future periods also ensures that management is held accountable for R&D investments made in the past. Investing in unprofitable projects will still have a negative effect on EVA since they are charged for the capital invested in it (Ehrbar, 1998: 169).

- ***STRATEGIC INVESTMENTS***

It takes some time before certain capital investments start generating returns. Since management is charged for the capital invested in the firm / division these types of projects could have a negative impact on present EVA levels. The proposed treatment of these types of investments in an EVA framework is to include them in a suspension account until they start to generate revenues. Capital charges based on the investment is not charged against EVA during this period, but added to the suspension account. Only when revenues are generated by the projects are the amounts in the suspension account included in the EVA calculation (Ehrbar, 1998: 170). This adjustment will ensure that management is not biased against projects with delayed revenues. Furthermore, it ensures that management is still charged for the capital tied up in the projects.

- ***ACQUISITIONS***

When acquiring another firm the excess amount paid over the fair value of the acquisition is included in the balance sheet as goodwill. According to GAAP this intangible asset is then usually amortised over a period of time. As a result, accounting figures are distorted by this amortisation process for a number of years.

The approach suggested by Stern Stewart is to include goodwill in the balance sheet and not to amortise it at all. The adjustments add back any goodwill amortisation that has been subtracted in the current year's income statement to NOPAT, and previous years' amortisation amounts are added back to the invested capital amount. The reasons provided for this approach are (Ehrbar, 1998: 172):

  - Managers are focused on cash flows and not on accounting entries.
  - In most cases goodwill represents an investment in items with indefinite lifetimes which will continue to generate revenues in future.
  - Shareholders will keep management accountable for the excess paid for an acquisition in perpetuity. They should consequently be prepared to earn an excess return on the invested capital.

- ***RECOGNITION OF EXPENSES***

According to GAAP expenses should be recognised in the period where they are incurred. In some firms, however, expenses are incurred to generate future revenues. Including these expenses in the calculation of EVA is to the disadvantage of these types of firms. The corresponding adjustment suggested by Stern Stewart is to capitalise the expense and to amortise it over a period of time (Ehrbar, 1998: 174).

- ***DEPRECIATION***

In practice, most firms apply the straight-line method to calculate depreciation. In those firms where heavily depreciated assets are still utilised to generate revenues, however, this approach presents a problem. New investments in equipment will result in a decrease in EVA and could result in a costly delay in the replacement of equipment. To solve this problem sinking-fund depreciation instead of straight-line depreciation is suggested (Ehrbar, 1998: 174).

- ***OTHER ADJUSTMENTS***

Some of the other adjustments suggested include restructuring charges (Ehrbar, 1998: 174), the treatment of different tax calculations (Ehrbar, 1998: 176), as well as a number of balance sheet adjustments (Ehrbar, 1998: 177). Other adjustments include those for inventory costing and valuation, pension-fund provisions, inflation, seasonality, etc. (Stewart, 1994: 73; Young & O'Byrne, 2001: 206-253).

3.3.4.6 INFLATION ADJUSTMENTS

Over the last two decades the South African economy experienced a dramatic change in levels of inflation. These changes in inflation could exert a pronounced effect on the financial performance of a firm. When the financial performance of a firm is evaluated it is, therefore, essential to understand the influence of changing levels of

inflation on the performance measures applied. Since inflation influences the firm's assets (such as property, plant and equipment, and inventories) as well as its capital (debt capital and cost of capital), the level of inflation could impact on EVA.

Stewart (1991: 227) does not consider inflation adjustments to the measure EVA to be important when inflation is low. Although absolute levels of EVA may be distorted by inflation, changes in EVA are normally calculated to evaluate a firm's financial performance. Stewart assumes that these EVA changes are not influenced by changes in inflation.

Black *et al*. (2001: 76) identify asset age and inflation as two of the factors that could result in the distortion of published financial statements. Since assets are indicated net of accumulated depreciation in the balance sheet, older assets will have lower book values than newer additions. As a result of inflation the replacement values of these assets will also be higher than their initial cost prices. Black *et al*. (2001) argue that it is important to adjust asset values to represent current replacement values rather than historical book values when evaluating a firm's shareholder value creation. Failure to address these distortions will result in higher levels of EVA which will be greatly reduced if assets are valued at their replacement values.

When depreciating assets are depreciated according to the straight-line method, this usually results in increasing levels of EVA over time. These increases are not generated by a more efficient utilisation of the assets, but are the result of a lower capital charge calculated on their decreasing book values. Fabozzi and Grant (2000: 164) refer to this as the "old plant trap". They also point out that inflation further increases the problem, since new assets added to the balance sheet are included at higher replacement values. This could have a negative effect on the growth of the firm, as management may postpone replacement and expansion in an attempt to maintain the lower asset values in the balance sheet (Fabozzi & Grant, 2000: 164).

The distorting effect of inflation on EVA has also been reported in a number of other studies. De Villiers (1997: 285) investigates inflation's effect on EVA and reports that the measure cannot be applied during periods of inflation to estimate a firm's

actual profitability. An adjusted EVA measure is proposed where the capital base and the accounting return are adjusted for inflation (De Villiers, 1997: 298).

Erasmus and Lambrechts (2006: 14) developed a theoretical model and compared the values of EVA in nominal and real terms calculated for a large number of different scenarios. They report differences in the behaviour of the two measures under similar circumstances and conclude that EVA in nominal terms is not suitable to be used as a financial performance measure during periods of inflation.

Warr (2005: 119) proposes inflation adjustments to depreciation, nominal debt, the book values of a firm's assets, and its WACC when calculating EVA. The results of his study indicate that inflation significantly distorts EVA during periods of inflation. Similar results are also obtained during periods of low inflation (Warr, 2005: 120). The study also investigates the measure's sensitivity to levels and changes in inflation and reports significant distortions (Warr, 2005: 135).

3.3.5 THE LINK BETWEEN NPV AND EVA

When attempting to maximise shareholder value the Discounted Cash Flow (DCF) method is usually the most appropriate valuation technique (Copeland *et al*., 1994: 70). Instead of focusing on EPS or other accounting based measures that could be distorted by GAAP, this approach utilises expected cash flows. By discounting the expected future cash flows of a project at an acceptable discount rate (usually the firm's cost of capital) and comparing this present value (PV) to the investment required to generate the cash flows its NPV can be determined. A positive NPV indicates that value is created, while a negative value indicates the opposite. The NPV of a project thus provides an indication of the incremental value added to the firm by accepting the project (Peterson & Peterson, 1996: 12).

The relationship between NPV and share prices was investigated by McConnell and Muscarella (1985: 420). According to their study the acceptance of capital expenditures results in an increase in share prices and they interpret this as an

indication that there is a positive relationship between NPV and market value creation.

According to Stewart (1991: 307) and Young and O'Byrne (2001: 44) calculating the present value of a firm's EVA provides the same results as the DCF approach. According to Grant (2003: 21) this relationship can be shown as follows for a single period NPV model where the invested capital needs to be returned at the end of the period:

$$\begin{aligned} NPV &= MVA \\ &= \frac{NOPAT}{1+c^*} - Capital_0 \end{aligned} \tag{3.6}$$

where:

$Capital_0$ = Initial capital investment

Therefore, it can be shown that (Grant, 2003: 23):

$$\begin{aligned} NPV &= \frac{Capital_0 \text{ x } (1+r)}{1+c^*} - Capital_0 \\ &= \frac{Capital_0 \text{ x } (r-c^*)}{(1+c^*)} \\ &= \frac{EVA}{(1+c^*)} \\ &= \text{Present value of EVA} \end{aligned} \tag{3.7}$$

where:

r = the return on the invested capital

Dillon and Owers (2001: 39), however, suggest that the relationship between EVA and NPV is more complex than the one provided by Grant. According to their study the relationship between the two values is as follows:

Present value of EVA = NPV + Ω - PV[D] (3.8)

where:

Ω = Cost of the investment – Present value of the capital charges
PV[D] = Present value of depreciation

When applying DCF techniques, accounting earnings cannot be used since they ignore the cost of capital. EVA and free-cash flows (FCF), however, include the cost of capital and O'Byrne (1999: 92) argues that they are suitable to be used for DCF purposes. FCF allocates the full amounts invested to the periods where they occur and is consequently poorly correlated to current market values. EVA manages to solve this problem by including a capital charge instead of the total investment. The difference between EVA and FCF is consequently (O'Byrne, 1999: 92):

$$EVA = NOPAT - c^{*} \times IC_{t-1} \quad (3.9)$$

$$FCF = NOPAT - Capital_{Inv} \quad (3.10)$$

where:

$Capital_{Inv}$ = total capital investment, net of depreciation

Since the present value of the depreciation and the capital charge included in EVA equals the initial investment ($Capital_0$), the following relationship should be observed (O'Byrne, 1999: 92):

$$\text{Present value of future FCF} = Capital_0 + \text{Present value of future EVA} \quad (3.11)$$

When calculating the present market value (PV) of a firm it is useful to distinguish between the current level of EVA and the expected future changes in EVA. According to O'Byrne (2000: 105):

$$\text{Market value} = \text{Capital}_0 + \text{PV of EVA}_0 + \text{PV of future changes in EVA}_0$$

$$= \text{Capital}_0 + \frac{\text{EVA}_0}{c^*} + \left(\frac{1+c^*}{c^*}\right) \text{ x PV of future } \Delta \text{ EVA}_i \quad (3.12)$$

$$= \text{Current operations value} + \text{Future growth value}$$

where:

ΔEVA_i = Change in EVA from year (i-1) to i

In order to maximise the shareholder value of a firm it is not only important that the current level of EVA should be maintained. The expected future growth in EVA should also be considered, since it could greatly contribute to the total value of the firm.

3.3.6 RELATIONSHIP BETWEEN EVA AND SHAREHOLDER WEALTH CREATED

The objective of a firm's management should be to maximise its shareholder wealth. A successful value based performance measure should be able to indicate what the effects of management's decisions are on shareholder value. According to Stern Stewart, EVA performs better than any other financial performance measure in explaining the shareholder wealth created by a firm. Claims made by the company include "Abandon earnings per share" (Stewart, 1991: 2), "Earnings, earnings per share, and earnings growth are misleading measures of corporate performance" (Stewart, 1991: 66), "EVA is the one measure that properly accounts for all the complex trade-offs involved in creating value" (Stewart, 1994: 136), and "… EVA is almost 50% better than its closest accounting-based competitor in explaining changes in shareholder wealth, a significant improvement" (Stewart, 1994: 75).

A number of studies have subsequently been conducted to investigate these claims. Although some of these studies support the claims made by Stern Stewart, mixed and contradicting results are also reported. In the next section the results from those studies supporting the EVA proponents are provided. Thereafter, those studies reporting contradictory and mixed results are also discussed. Finally, studies investigating the differences between the performance of firms adopting EVA management systems and those not employing it are highlighted.

3.3.6.1 SUPPORTING RESULTS

According to Stewart (1994: 74) empirical research on the actual behaviour of share prices supports the link between EVA and shareholder value created. He reports that when the changes in EVA over a five year period are considered, it is found that they account for almost 50% of the changes in MVA (Stewart, 1994: 75). When considering other traditional performance measures a much lower explanatory power is observed. Growth in earnings per share, for instance, only accounts for between 15% and 20% of the changes in MVA (Stewart, 1994: 75).

The strong relationship between EVA and MVA, as well as EVA and changes in MVA, is also highlighted by Walbert (1994: 110). The advantage offered by EVA when explaining changes in MVA is also mentioned by Stewart (Stern Stewart EVA Roundtable, 1994: 49).

Based on these results it would appear that EVA offers a clear advantage over the other traditional measures. An important distinction between wealth and shareholder returns, however, is pointed out. According to Stewart (1994: 81) EVA is not intended to explain total shareholder returns, but rather to consider changes in MVA. This distinction is also made in the Stern Stewart EVA Roundtable (1994: 49).

Grant (1996: 44) conducts a regression analysis between the measures EVA-to-capital and MVA-to-capital. A statistically significant relationship with an R^2 value of 0.316 is observed between the two measures. The cost of capital, as well as the spread

between the return on capital and the cost of capital, is also investigated. The adjusted R^2 value for the regression of these two variables with the MVA-to-capital ratio is 0.374. The spread between the return and the cost of the capital has a highly significant effect on the ratio, while the cost of capital also has a significant positive effect on the MVA created. After extending the study to the 50 largest wealth creators in the USA an even stronger linear relationship between EVA and MVA is observed, with over 83% of the variation in the MVA explained by EVA.

Lehn and Makhija (1996: 36) also observe a positive correlation between EVA and MVA. Furthermore, the correlation between EVA and share returns is higher than any of the other measures investigated in their study.

O'Byrne (1996: 117), reacting to a study by Easton, Harris and Ohlson (1992), argues that EVA has a greater explanatory ability than EPS when considering share returns. According to him researchers fail to recognise this ability since they ignore certain market valuation characteristics with regard to EVA. He states that:

- *The market places a higher multiple on positive EVA values than negative values when firms are valued*. Consequently a firm with a negative EVA value will be given a higher value than if the same multiple is applied to both positive and negative EVA firms.
- *The market allocates higher multiples for smaller firms*. An inverse relationship thus exists between the multiple and the size of the firm.

Incorporating these characteristics in the remainder of his study, he observes that the absolute levels of EVA, as well as the changes in EVA, are better predictors of market values than NOPAT and free-cash flow (O'Byrne, 1996: 121). In terms of NOPAT and capital similar results to those of Easton *et al.* (1992) are obtained. EVA, however, outperforms the two measures in explaining the variation in market value changes.

O'Byrne (1997: 54) repeats his previous results with regard to the relationship between EVA and share returns. He also identifies certain shortcomings associated with studies that challenge the usefulness of EVA. These include:

- Their focus on shareholder returns instead of excess shareholder returns.
- Their failure to consider expected EVA improvements as a variable when explaining shareholder returns.
- The failure to recognise the different multiples applied by the market for positive and negative EVA values.
- The failure of the other researchers to recognise that their models are actually similar to EVA models.

Following the negative results reported in a study conducted by Biddle, Bowen and Wallace (1999), O'Byrne identifies the following three reasons why their conclusions regarding the use of EVA are questionable:

- The earnings model proposed by Biddle *et al*. (1999) includes finance cost (based on debt capital) but not the equity capital costs. This results in a hybrid earnings model (O'Byrne, 1999: 94).
- The explanatory power of their NOPAT model is the result of including NOPAT as well as capital. This results in a model that is in fact an EVA model (O'Byrne, 1999: 95).
- In order to predict shareholder returns by means of EVA, the expected future EVA performance needs to be included in the valuation process. Since Biddle *et al.* (1999) did not develop a model that considers improvements in EVA their results are meaningless (O'Byrne, 1999: 96).

Significant, positive correlations between EVA and abnormal share returns are reported by Bacidore, Boquist, Milbourne and Thakor (1997: 17). An adjusted EVA value, Refined Economic Value Added (REVA), is also proposed. This measure is similar to EVA, but the capital charge is calculated on the market value of the invested capital instead of the book value. The correlation between this measure and absolute returns are also reported to be statistically significant. In order to examine the effect of the value of the measures in the previous year on returns they are also included in the analysis. Negative relationships are observed for both the measures. In the case of EVA this relationship is significant, while it is insignificant for REVA. This is interpreted as an indication that the current year's REVA value includes

revaluations based on the previous year's performance (Bacidore *et al.*, 1997: 17) while EVA does not. Including both the measures simultaneously in a regression analysis yields a statistically significant positive relationship for REVA and a negative relationship for EVA. It appears as if REVA contains information relevant to predicting abnormal returns not captured in EVA (Bacidore *et al*., 1997: 18). They conclude that both measures are significantly related to abnormal returns but that REVA provides more information than EVA (Bacidore *et al.*, 1997: 19).

Grant (2003: 37) also observes statistically significant relationships between EVA-to-capital and MVA-to-capital and an adjusted R^2 value of 27% is reported.

Worthington and West (2004: 201) investigate the relative and incremental information content of EVA and compare it to other financial measures. The results from their study indicate that EVA is more closely associated with share returns than the other measures investigated. Based on the results from the incremental information content tests included in their study they also conclude that the accounting adjustments required to calculate EVA contribute statistically significant information content.

3.3.6.2 CONTRADICTORY RESULTS

Not all studies, however, report the same level of confidence in EVA's ability to explain share returns. Biddle *et al*. (1997) investigate the information content of the measures EVA, RI, earnings before extraordinary item (EBEI) and cash from operations (CFO). Based on their results they reject the claim that EVA has the highest informational content. EBEI is found to be significantly more highly associated with annual market-adjusted share returns than RI, EVA and CFO (Biddle *et al.*, 1997: 316). Although EVA did provide incremental information to EBEI when explaining share returns, the incremental contributions of the EVA components are economically insignificant (Biddle *et al.*, 1997: 320). Furthermore, earnings dominate EVA in explaining firm values (Biddle *et al.*, 1997: 330). These results are repeated in two additional studies conducted by them (Biddle, Bowen and Wallace, 1998: 68; Biddle *et al*., 1999: 74).

Dodd and Chen (1996: 27; 1997: 5) also report findings that are consistent with those obtained by Biddle *et al*. (1997). Although EVA and share returns are correlated, these studies report low levels of correlation. The studies also indicate that unadjusted accounting measures are more closely correlated with share returns than EVA.

Ferguson and Leistikow (1998: 85) apply a similar approach to Bacidore *et al*. (1997) and reject claims that REVA provides more information than EVA. They argue that REVA is inconsistent with finance theory. Furthermore, it is pointed out that even though the relationship between REVA and abnormal returns is highly significant, the R^2 value is extremely low. As a result REVA explains almost none of the variation in the abnormal share returns (Ferguson & Leistikow, 1998: 83). They conclude that EVA is the appropriate measure to apply.

Clinton and Chen (1998: 40) find that most of the correlations between EVA, share prices and share returns are either negative or insignificant. EVA is also the only one of the measures investigated in their study that did not consistently reveal significant associations with share prices or share returns (Clinton & Chen, 1998: 41). According to Stewart (1994: 82) EVA should not be compared to shareholder returns, but rather to shareholder value. Clinton and Chen (1998: 42), however, report that the correlation between EVA and share returns is higher than between EVA and the share price. Although these correlations were not consistently significant, it still contradicts the claims made by Stewart.

In another study that investigates EVA's ability to explain share prices, De Villiers and Auret (1998: 54) determine that EPS outperforms EVA. Year-on-year changes in EPS also offer a better explanation for share prices than changes in EVA (De Villiers & Auret, 1998: 58). Their study concludes that EVA does not offer an advantage over the traditional measure EPS in terms of explaining share prices (De Villiers & Auret, 1998: 62). Possible explanations for EVA's weak performance include its link to book value instead of total value and the distorting effect of inflation.

Farsio *et al*. (2000) investigate the relationship between EVA and total returns, calculated for different share indices. When considering the relationship between the current value of EVA, and total returns in the subsequent year, a negative regression slope is observed (Farsio *et al.*, 2000: 116). It appears as if the current level of EVA does not result in a higher total return during the next year. When conducted for values from the same year a weak positive relationship is observed ($R^2 = 0.07$) (Farsio *et al.*, 2000: 117). Including EPS in the regression analysis yields a much higher explanatory power. Almost 99% of the variation in the total return is explained by EVA and EPS combined.

Turvey, Lake, Van Duren and Sparling (2000: 399) investigate the relationship between EVA and the share returns on a sample of Canadian firms in the food processing sector. Their results indicate that no relationship exists between EVA and the stock market performance of the firms' shares (Turvey *et al*., 2000: 415). Sparling and Turvey (2003: 266) conduct a similar study for a sample of firms obtained from the Stern Stewart Fortune 1000 database. They evaluate the relationship between EVA and share returns over a three, five and ten year period, and report weak correlations for all three the periods.

Kramer and Pushner (1997: 41) test the relationship between EVA and MVA. The results of their study indicate that there is a stronger relationship between NOPAT and MVA than between EVA and MVA. Based on these results they conclude that the market seems to focus more on profit figures than on EVA. Kramer and Peters (2001: 41) also investigate the relationship between EVA and MVA, but include the effect of capital intensity in their study. They investigate a sample of firms located in different industries and find that EVA is not biased by the level of capital intensity. The results of the study, however, indicate that NOPAT outperforms EVA as a proxy for MVA.

Bao and Bao (1998: 252) consider EVA as a surrogate for a firm's abnormal economic earnings. They evaluate the explanatory power of abnormal economic earnings relative to value added and report that the results are either statistically insignificant, or that it provides the wrong sign. Their study, however, are conducted

for a period of only two years, and they indicate that this could have an effect on their final results.

Based on an evaluation of the relative and incremental information content of EVA, Palliam (2006: 204) concludes that EVA is a relatively poor predictor of share returns. The relationship between EVA and shareholder returns is found to be weak, and earnings manages to outperform the measure in the relative information content tests. Similar results are reported by Peixoto (2006) for a sample of Portuguese firms, and Kyriazis and Anastassis (2007: 71) for a sample of firms listed on the Athens Stock Exchange.

Some studies question the theoretical validity of EVA. Paulo (2003: 328) argues that EVA is based on financial theory that is seriously flawed. According to him EVA is not a suitable financial performance measure. He bases his argument on the inefficiencies of the CAPM and those studies that indicate that the model is not suitable to use when calculating the cost of capital. He concludes that applying EVA as financial performance measure could expose financial professionals to the risk of legal action (Paulo, 2003: 339).

Keef and Roush (2003: 251) evaluate the theoretical construct that underlies EVA and investigate the relationship between economic profit and the market's valuation of a firm. Their results indicate that there is no relationship between EVA and a firm's share performance. They conclude that the real benefits of EVA is not the value of the measure reported, but rather the collective attempts by all levels within a firm to increase its value (Keef & Roush, 2003: 252).

3.3.6.3 MIXED RESULTS

When investigating the relationship between EVA and share returns mixed results are also reported. Peterson and Peterson (1996: 45) indicate that the market value added measures (including EVA), as well as the traditional accounting performance measures, are highly correlated with stock returns. The market value added measures have slightly higher correlations, but they do not really provide any additional information above the traditional measures. Claims that EVA outperforms the other measures could, therefore, not be supported based on the results of their study.

Chen and Dodd report mixed results regarding EVA's relationship with share returns. Although a significant relationship exists between EVA and share returns, the correlation is low (Chen & Dodd, 1997: 325). Even though EVA provides significant information beyond the traditional measures included in their study (Chen & Dodd, 1997: 328) they conclude that it should not entirely replace the traditional accounting measures (Chen & Dodd, 1997: 329). The small differences observed between EVA and RI also results in the question whether the EVA adjustments are necessary. By applying the RI measure almost all of the benefits of the more costly (and complex) EVA method are obtained.

3.3.6.4 ADOPTERS VS. NON-ADOPTERS

According to Ehrbar and Stewart (1999: 19) those companies that adopted EVA as management system outperformed comparable non-adopters in terms of the shareholder returns earned during a five year period following the implementation of the measure. Subsequently a number of studies focused on the performance of those firms that adopted EVA as part of their management system compared to non-adopters.

Kleinman (1999) does not attempt to determine the relationship between EVA and shareholder returns. Instead, he compares the total shareholder returns achieved by firms that adopted EVA with those that did not. When considering the EVA adopters, significantly higher total returns are achieved than in the case of non-adopters

(Kleinman, 1999: 86). The effect of EVA implementation on the operating and financial performance measures is also consistent with the actions aimed at increasing EVA (Kleinman, 1999: 89). A similar study conducted by Hogan and Lewis (1999), however, find no significant differences in the share price performance of EVA adopters and non-adopters.

In another study similar to the one conducted by Kleinman (1999), Abdeen and Haigh (2002) also compare the performance of firms adopting EVA to those that did not. In terms of some of the performance measures included in their study, firms that adopted EVA outperform those that did not. The opposite, however, is observed when considering EPS and the total return to investors (Abdeen & Haigh, 2002: 35). These results contribute to their study's conclusion that the popularity of EVA as performance measure will eventually decrease.

Hogan and Lewis (2005: 721) investigate the long-term investment decisions, operating performance and shareholder value creation of firms employing compensation plans based on economic profits. They report similar performances for adopters and non-adopters of these types of compensation plans. When investigating different types of firms, however, they indicate that economic profit plans are better suited to firms that anticipate the implementation of these plans than other firms (Hogan & Lewis, 2005: 742). These anticipated adopters manage to increase profitability, and outperform similar firms not implementing economic profit-based compensation plans.

Wallace (1997: 275) investigates whether the management actions of firms that implement compensation plans based on residual income measures are influenced by the incentives offered under these plans. He reports that the managers of firms who are evaluated and compensated based on the residual income measures act in such a way as to increase these values. Wallace (1998: 1) also conducts a survey of firms adopting EVA compensation plans. The results from this study support his previous study, and it is reported that implementing EVA type performance measures change the focus of management from accounting earnings to generating more than the firm's cost of capital (Wallace, 1998: 10).

Dodd and Johns (1999: 15) also investigate differences between firms adopting EVA and those that did not. Their results indicate that EVA adopters appear to move away from traditional financial measures in their executive contracts. It also appears as if less emphasis is placed on measures of effectiveness and customer satisfaction. According to them these changes expose the EVA adopters to risk, since it entails a single financial measure to manage different aspects of the firm.

Divergent results in terms of EVA's relationship to shareholder returns are thus reported. In most cases, Stern Stewart rejects the negative results, and blames it on the inappropriate focus on shareholder returns rather than applying EVA as a measure of shareholder value.

According to Garvey and Milbourn (2000: 211) the correlation between EVA and share returns is not the most important factor to consider when determining the value added by the measure. They quote Gjesdal (1981) who indicated that a high correlation with share returns does not necessarily indicate that the measure is adding value. Their study concludes that it may be more important to determine under what circumstances, and also why, EVA performs better than other performance measures.

Machuga, Pfeiffer and Verma (2002: 59) also decide not to focus on the relationship between EVA and share returns. Instead, they investigate the ability of EVA to predict future EPS values and report that EVA contains incremental information over current EPS values when attempting to predict future EPS values.

3.4 CASH VALUE ADDED

3.4.1 DEFINITION

The measure Cash Value Added (CVA) is associated with the Boston Consulting Group (BCG) and it is considered to be a combination of EVA and CFROI (Gupta & MacDonald, 2000: 237). Similar to EVA a capital charge based on the capital invested in the firm is subtracted. CVA is consequently another form of RI (Young & O'Byrne, 2001: 428). Instead of using economic profit figures, however, CVA calculates the excess cash flows generated over the capital cost. The measure includes all the benefits of EVA, while also attempting to improve on it by using cash flows instead of profit figures (Martin & Petty, 2000: 128).

One of the major differences between CVA and EVA is that depreciation and accruals are added back when calculating the cash flow values included in CVA. Furthermore, the accumulated depreciation is also included with the invested capital amount when the capital cost is calculated.

In this part of the chapter the measure CVA will be investigated. Section 3.4.2 outlines the calculation of CVA, while section 3.4.3 focuses on the characteristics of the measure. Finally, the results of empirical studies conducted on the relationship between CVA and shareholder wealth created are provided in section 3.4.4.

3.4.2 CALCULATION OF CVA

A firm's CVA is calculated by considering the operating cash flow rather than operating profit (as was the case for EVA), and subtracting a gross capital charge. To convert NOPAT into the operating cash flow, depreciation and amortisation are added back (Martin & Petty, 2000: 128). Changes in other long-term liabilities, such as provisions and deferred taxes, are also added to NOPAT to convert it into a cash flow figure (Young & O'Byrne, 2001: 441).

Unlike EVA, the capital charge is based on the gross value of the invested capital and not on the net figure (Martin & Petty, 2000: 141). Accumulated depreciation is, therefore, added back to the invested capital.

$$\begin{aligned} CVA_t &= \text{Operating cash flow - gross capital charge} \\ &= (NOPAT_t + CVAAdj_{op}) - [c^* \text{ x } (IC_{t-1} + AccDepr)] \end{aligned} \quad (3.13)$$

where:

$CVAAdj_{op}$ = Depreciation, amortisation and changes in other long-term liabilities

AccDepr = Accumulated depreciation

3.4.3 CHARACTERISTICS OF CVA

According to Young and O'Byrne (2001: 429) the calculation of CVA is less complex than the calculation of EVA since no accounting adjustments are required. They also argue that since depreciation is added back during the calculation of CVA the measure is not influenced by a firm's depreciation policy (Young & O'Byrne, 2001: 440). They perceive this characteristic of CVA as an advantage over EVA, where different depreciation policies can result in large variations in the value of the measure.

Another benefit of CVA is that it can be applied at the corporate, as well as the divisional level (this is not always the case for the measure CFROI). Furthermore, the cash flow values included in the calculation of CVA can be adjusted for inflation (Young & O'Byrne, 2001: 453; Nichols, 1998: 27).

A number of limitations with regard to CVA, however, are also highlighted. According to Young and O'Byrne (2001: 461) EVA is a better financial measure than CVA. They argue that the problem of different depreciation policies in the case of

EVA can be solved by including an accounting adjustment. Furthermore, they indicate that by removing accruals, depreciation and amortisation from the calculation of CVA the measure may lose important information required by the market when evaluating a firm. The process of removing the effects of accounting accruals in the calculation of CVA could also be relatively complex. They also warn that the incorporation of CVA values into valuation models should be considered carefully since CVA is based on historical accounting figures that do not represent the expected future cash flow generated by the enterprise (Young & O'Byrne, 2001: 442).

Another problem experienced with CVA occurs when uneven cash flow values are considered (Martin & Petty, 2000: 149). The resulting CVA values may provide conflicting signals with regard to the value creation of the projects under consideration.

3.4.4 CVA AND SHAREHOLDER VALUE

Relatively little empirical research has been conducted on the relationship between CVA and shareholder value creation. Clinton and Chen (1998: 41) employ a similar measure to cash value added called residual cash flow (RCF). They report higher levels of correlation between RCF and share returns than for the measures EVA and CFROI.

Fernandez (2002), however, reports a low level of correlation between CVA and shareholder returns for a sample of United States companies. He concludes that CVA does not measure shareholder value creation.

3.5 CASH FLOW RETURN ON INVESTMENT

3.5.1 INTRODUCTION

According to Obrycki and Resendes (2000: 163) one of the problems experienced with the application of EVA is that it is difficult to compare the value of the measure across different firms. Amongst others, they warn that differences in the accounting treatment of certain items, as well as differences in the average age of assets, could result in EVA values that are not comparable.

According to De Villiers (1997: 300) and Warr (2005: 120) EVA is also distorted by inflation, and cannot be used as performance measure during periods of inflation. Comparing EVA figures for different firms from different countries over different years could be problematic due to the distorting effects of inflation.

The measure Cash Flow Return on Investment (CFROI) could overcome some of these limitations. CFROI is calculated by using cash flows, and provision is also made for the effect of inflation by converting all the cash flows into inflation-adjusted values (Grant, 2003: 189). While EVA is predominantly used as corporate financial performance measure, CFROI is also applied by investments analysts (Obrycki & Resendes, 2000: 157). The measure is associated with HOLT Value Associates which applies it in a money management context, and Boston Consulting Group (BCG) which focuses on its application in a corporate finance environment (Martin & Petty, 2000: 111). Both companies, however, attempt to convert accounting data into an economic measure that may be used to identify shareholder value creation.

In this part of the chapter the measure CFROI will be investigated. Section 3.5.2 provides a definition of CFROI, while section 3.5.3 outlines the calculation of the measure. Section 3.5.4 focuses on the interpretation of the measure, and section 3.5.5 considers the link between CFROI, EVA and NPV. The CFROI valuation model is discussed in section 3.5.6. Finally, the results of empirical studies conducted on the

relationship between CFROI and shareholder wealth created are provided in section 3.5.7.

3.5.2 DEFINITION

According to Young and O'Byrne (2001: 382) CFROI compares the inflation-adjusted cash flow generated by a firm with the inflation-adjusted cash investment required to achieve it. By including the estimated lifetime of the firm's depreciable assets and the expected residual value of its non-depreciable assets, an internal rate of return is calculated. This CFROI figure is then compared to the firm's inflation-adjusted (real) cost of capital. One of the characteristics of this measure is that it focuses on the return offered to all the capital providers of the firm and not only the shareholders (Madden, 1999: 101).

CFROI is normally incorporated in a valuation model that is used to determine the intrinsic value of a firm's shares (Madden, 1998: 31). By considering CFROI and other factors, such as growth and CFROI fade rates, the expected net cash receipts of a firm or project may be estimated and discounted to determine its intrinsic value (Madden, 1999: 65).

However, by comparing the CFROI of a firm to its real cost of capital it may be determined whether value is created or destroyed when investment in the firm is increased (Grant, 2003: 193; Young & O'Byrne, 2001: 383). If CFROI is less than the firm's real cost of capital, additional investment would yield a negative NPV and the investment would not contribute to the creation of shareholder value. Alternatively, if the CFROI is greater than the real cost of capital an increase in investment would provide a positive NPV and shareholder value would be created (Fabozzi & Grant, 2000: 25).

Furthermore, unexpected increases in a firm's level of CFROI should have a positive effect on its share price (Madden, 1999: 10). Since investments in projects with

positive NPV should contribute to the creation of shareholder value this could be expected.

According to Young and O'Byrne (2001: 383) the most important points to remember in terms of CFROI are:

- *The calculation of the measure is similar to that of an internal rate of return (IRR), but it should not be interpreted in the same way as an IRR*. CFROI values are calculated for each financial year. A firm is not endeavouring to merely generate CFROI values in excess of its cost of capital, but it also attempts to improve its CFROI value over time. Unexpected improvements in the value of the measure should contribute to the creation of shareholder value.

- *Since its calculation is based on cash flows it removes even more of the influences of accrual accounting than EVA*. Items obtained from the financial statements of a firm are adjusted in an attempt to convert the figures into cash flow values rather than profit figures.

- *The measure is inflation-adjusted*. It should be compared to real rates of return. In order to evaluate a CFROI value, it is compared to the firm's real cost of capital.

3.5.3 CALCULATION OF CFROI

Madden (1999: 110) considers the calculation of CFROI to be based on basic DCF principles. The four inputs required to calculate the measure are as follows:

- The average life of the depreciating assets.
- The total amount of assets (includes both depreciating, as well as non-depreciating assets) adjusted for inflation.

- The inflation-adjusted cash flows generated by the assets over their lifetime.
- The final inflation-adjusted residual value of the non-depreciating assets at the end of the asset lifetime.

These four values are represented in the cash flow diagram provided in Figure 3.1:

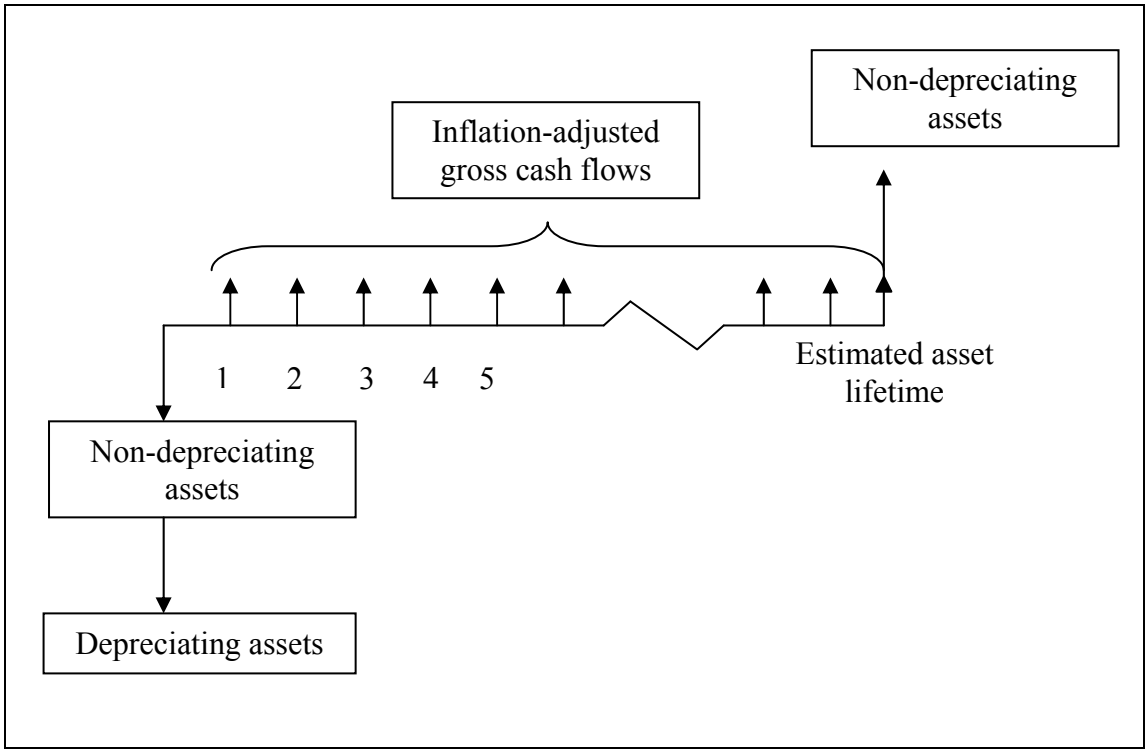


Figure 3.1: Cash flow diagram representing the four CFROI components

Based on these inputs the firm's CFROI value is calculated as the discount rate that would ensure that the present value of all the future cash flows (the equal annual inflation-adjusted gross cash flows, as well as the terminal non-depreciating assets amount) is equal to the initial investment (total non-depreciating and depreciating assets). As such, the CFROI may be viewed as a return on investment (ROI). However, it is not calculated for individual projects, but rather for the firm as a whole.

The cash flows identified above need to be adjusted for inflation. In the next sections these adjustments and the calculation of the four components are discussed in more detail.

3.5.3.1 ASSET LIFETIME

The asset lifetime is the estimated average economic life of the tangible depreciating non-current assets of the firm. This figure provides an indication of the remaining period over which the cash flow will be generated. According to Madden (1999: 113) it is calculated as follows:

$$\text{Asset life} = \frac{\text{Adjusted gross plant}}{\text{Depreciation on the gross plant}} \qquad (3.14)$$

The adjusted gross plant figure consists of all tangible non-current assets. Land and improvements, however, are excluded from this figure since no depreciation is provided on these items. Construction in progress (CIP) is also excluded since no depreciation based on this amount is provided for while it is part of the construction process. Depreciation on CIP is only calculated when these items are completed.

Only the depreciation provided on the adjusted gross plant figure should be included in this calculation. The amortisation of goodwill should not be included in this figure.

3.5.3.2 INFLATION-ADJUSTED TOTAL ASSETS

The inflation adjusted total assets amount is calculated as the total of the depreciating and the non-depreciating assets.

3.5.3.3 INFLATION-ADJUSTED DEPRECIATING ASSETS

According to Madden (1999: 123) the inflation-adjusted depreciating assets amount is calculated as follows:

Current cost depreciating assets = Inflation-adjusted Gross Plant + Construction in Progress + Inflation-adjusted Gross Leased Property + Adjusted Intangibles (3.15)

The different components of the inflation-adjusted depreciating assets identified above will be discussed in greater detail in Appendix 1.

3.5.3.4 INFLATION-ADJUSTED NON-DEPRECIATING ASSETS

The inflation-adjusted non-depreciating assets are included in the total asset figure invested in the beginning of the period considered. At the end of the asset lifetime this value represents a cash inflow. The assets consist of (Madden, 1999: 132):

Current cost non-depreciating assets = Monetary assets – Adjusted current liabilities + Investments and loans granted + Current cost inventories + Current cost land and improvements (3.16)

The calculations of the components of the current cost non-depreciating assets are discussed in more detail in Appendix 1.

3.5.3.5 INFLATION-ADJUSTED GROSS CASH FLOW

This amount should be a reflection of the total cash flow generated by the firm's operations, and ignores the method of financing. The figure is calculated for a specific financial year, and it is assumed that the same amount will be generated for each of the years included in the asset lifetime. The amount is calculated as follows (Madden, 1999: 133):

Net profit after tax

+	Depreciation and amortisation
+	Adjusted finance cost
+	Rental expense
+ / -	Monetary holding gain / (loss)
-	Cost of sales adjustment for replacement value of inventories
+	Net pension expense
+	Minority interest
+	Special item after tax
=	**INFLATION-ADJUSTED GROSS CASH FLOW**

(3.17)

The calculations required to determine the inflation-adjusted gross cash flow are provided in Appendix 1.

3.5.3.6 CALCULATION

- ***MULTIPLE PERIOD APPROACH TO CALCULATING CFROI***

In order to calculate a firm's CFROI, the inflation-adjusted cash flows discussed in the preceding sections are included in an IRR calculation. The discount rate that ensures that the present values of the constant inflation-adjusted gross cash flows and the residual value of the non-depreciating assets equals the inflation-adjusted total asset amount, is the firm's CFROI (Fabozzi & Grant, 2000: 25).

- ***SINGLE PERIOD APPROACH TO CALCULATING CFROI***

According to Martin and Petty (2000: 118) it may be preferable to calculate CFROI for a single period under certain circumstances. These include situations where the calculation of the measure becomes too complex or where a firm is generating negative cash flows. The CFROI is then calculated as follows (Martin & Petty, 2000: 119):

$$\text{CFROI} = \frac{\text{Sustainable cash flows}}{\text{Current cost gross investment}} \quad (3.18)$$

The sustainable cash flow is calculated after subtracting a sinking fund depreciation amount from the inflation-adjusted gross cash flow. The amount of non-depreciating assets is also excluded from the calculation.

3.5.4 INTERPRETATION OF CFROI

Young and O'Byrne (2001: 383) warn that although CFROI is calculated in a similar way as an IRR it is important to remember that it cannot be interpreted in exactly the same way. The absolute level of a firm's CFROI does not indicate whether the firm is creating or destroying shareholder value. In order to determine this, the measure needs to be compared to a benchmark value. Furthermore, it is also important to consider whether a firm is able to maintain or improve its level of CFROI. Failure to achieve this will result in the destruction of shareholder value.

Unlike EVA, where the firm's WACC is normally used to determine its cost of capital, HOLT Value Associates use a firm-specific discount rate when evaluating CFROI (Martin & Petty, 2000: 117; Madden, 1999: 10). This discount rate is based on the CFROI level, the sustainable asset growth rate, as well as a market derived discount rate (Martin & Petty, 2000: 117).

The market derived discount rate is obtained by considering a large representative sample of firms. Firstly, the total market value of their equity and debt at a certain point in time is calculated. The next step is to estimate the expected future cash flow generated by these firms for the next financial period. These cash flow estimates are obtained by considering earnings expectations published by market analysts. The market derived discount rate is then determined by solving the following equation for a single return period (Young & O'Byrne, 2001: 423):

$$\text{Aggregate } MV_{equity+debt} = \frac{\text{Expected aggregate NCF}}{1 + k_{market}} \quad (3.19)$$

where:

$MV_{equity+debt}$ = the total market value of a number of firms' equity and debt capital

NCF = the expected net cash flow for the next financial year, based on market analysts' earnings forecasts

k_{market} = the market derived discount rate

According to Madden (1999: 83) the market derived discount rate has two major benefits over the CAPM. Firstly, it considers the expected future cash flows of the market, while the CAPM is based on historical information. Furthermore, the market derived discount rate is a product of the CFROI valuation model itself.

Firm-specific discount rates are obtained in a similar way. By comparing the firm-specific rate with the market rate a risk differential can be calculated (Madden, 1998). The approach applied by HOLT Value Associates assumes that a firm's risk is a function of its size and financial leverage, and that this risk cannot be eliminated by means of diversification (Young & O'Byrne, 2001: 425). The risk differential can consequently be applied to evaluate the risk associated with a specific firm.

In those cases where the CFROI value exceeds the firm-specific discount rate, the firm's NPV is positive (Fabozzi & Grant, 2000: 25). Consequently, shareholder value is created, while it is destroyed by CFROI levels below the discount rate (Young & O'Byrne, 2001: 383). It is also possible to compare CFROI to a real rate calculated for an industry (Martin & Petty, 2000: 117). This enables analysts to identify the greatest shareholder value creators in an industry.

3.5.4.1 BENEFITS OF CFROI

According to Martin and Petty (2000: 116) the primary advantages of CFROI include:

- The conversion of accounting profits into cash flow figures.
- The use of inflation-adjusted total cash flows rather than the depreciated book values to measure the investment required to support a firm's operations.
- The recognition of the life time of the assets utilised to generate the cash flows.

Madden (1999: 9) considers the fact that inflation-adjusted cash flows are used for the CFROI calculation as one of the major benefits of applying this approach. This enables comparisons over time, and also between firms located in different countries. Since it removes some of the accounting distortions, Peterson and Peterson (1996: 29) also regard the use of cash flows instead of accounting figures as a benefit associated with CFROI.

Madden (1999: 108) also suggests that CFROI solves the problem associated with accounting reserves. These reserves are usually easy to manipulate and could distort the financial performance of a firm. According to the CFROI approach these reserves are excluded from the calculations.

Another benefit is that the measure is expressed as a return percentage, rather than a monetary amount (Peterson & Peterson, 1996: 29). This ensures even greater comparability between different firms, since the measure is not influenced by the size of the investment (Fabozzi & Grant, 2000: 165). A return figure is also easily understood by all levels within a firm (Young & O'Byrne, 2001: 417).

Dzamba (2003: 11) also indicates that CFROI represents the future risk exposure of the firm, since it is a risk-adjusted discount rate. Because the CFROI calculation focuses on cash it may also be a more applicable measure for shareholders, who tend to focus on cash dividends.

When calculating CFROI, gross investments are included. Accumulated depreciation amounts are added back to the book values of the assets employed to generate cash flows. As a result of this, the measure removes the problem of heavily depreciated assets (Martin & Petty, 2000: 131) as well as different depreciation policies.

3.5.4.2 DISADVANTAGES OF CFROI

One of the most common complaints regarding CFROI is the complexity of its calculations (Young & O'Byrne, 2001: 407; Ehrbar, 1998: 166). In order to calculate the measure a large number of accounting adjustments need to be completed. Furthermore, all of these adjustments need to be implemented, unlike EVA, where the number of adjustments depends on the firm.

In the case of start-up operations large capital outlays are usually combined with low or negative cash flows. Under these situations, CFROI may not be the ideal performance measure to apply (Madden, 1999: 80). Another example where a CFROI system will add limited value to a firm is where it consists of a large portfolio of different projects with varying levels of CFROI. The firm value for CFROI is an average for the portfolio and it is difficult to identify projects with low or high levels of CFROI (Madden, 1999: 80)

One of the general problems experienced with IRR-type measures is the difficulty to communicate it to all levels of a firm. Translating the figure into actions also presents a challenge (Fabozzi & Grant, 2000: 166). Another criticism is that it is not exactly clear how to tie CFROI to a management compensation system (Young & O'Byrne, 2001: 422).

When evaluating projects with unequal cash flows and a positive NPV, CFROI could provide mixed signals. Even though the project is profitable (the NPV is greater than zero) there may be periods where a CFROI system could indicate the opposite (Martin & Petty, 2000: 149). Stewart (1994: 81) also indicates that the maximisation of a firm's NPV, and not its IRR, is the correct way to increase value. When applying CFROI this needs to be taken into consideration.

Peterson and Peterson (1996: 29) also indicate that the inflation-adjusted figures used in the calculation of CFROI may expose it to some weaknesses. Since the inflation adjustments are only estimates, the quality of the estimates could greatly influence the measure. Since the cost of capital applied in evaluating the CFROI value also needs to be adjusted for inflation, this adds to the complexity of the estimates.

Fabozzi and Grant (2000: 166) argue that a CFROI system mixes operating and financing decisions. As a result it is not always possible to determine whether changes in CFROI are the result of operating changes, or financing changes. It is, therefore, important to include the level of financial leverage when comparing different firms.

3.5.5 RELATIONSHIP BETWEEN CFROI, NPV AND EVA

In a single-period wealth creation model it is possible to express the NPV of a firm in terms of CFROI and EVA. Fabozzi and Grant (2000: 11) and Grant (2003: 34) consider CFROI to be the discount rate that ensures that the present value of a firm's cash flows equals the investment required to generate those cash flows. According to them, the following relationship should be observed over a single return period, where the invested capital ($Capital_0$) is returned at the end of the period:

$$\frac{NOPAT}{(1+CFROI)} - Capital_0 = 0 \qquad (3.20)$$

Consequently:

$$NOPAT = Capital_0 \times (1 + CFROI) \qquad (3.21)$$

Based on this:

$$\text{NPV of the firm} = \frac{\text{NOPAT}}{\left(1+c^*\right)} - \text{Capital}_0$$

$$= \frac{\text{Capital}_0 \text{ x } \left(1+\text{CFROI}\right)}{\left(1+c^*\right)} - \text{Capital}_0 \text{ x } \frac{\left(1+c^*\right)}{\left(1+c^*\right)}$$

$$= \frac{\text{Capital}_0 \text{ x } \left(\text{CFROI}-c^*\right)}{\left(1+c^*\right)}$$

$$= \frac{\text{EVA}}{\left(1+c^*\right)} \qquad (3.22)$$

The sign of the firm's NPV (positive or negative) is thus determined by the spread between CFROI and its cost of capital. In terms of value creation, it is consequently equivalent to the maximisation of EVA. A positive NPV is obtained either by ensuring that CFROI exceeds the cost of capital, or generating a positive EVA value (Fabozzi & Grant, 2000: 12).

3.5.6 CFROI VALUATION MODEL

When the intrinsic value of a firm is compared to its actual market value it is possible to estimate the market's perception of its future value creation potential. If a firm is expected to perform relatively well in future, a large difference between the two values should exist, and vice versa. According to Young and O'Byrne (2001: 389):

Value of future investments = Intrinsic value of the firm – Value of its existing assets

The intrinsic value of the firm may be calculated by applying the CFROI valuation model. According to this model the intrinsic value of a firm can be obtained by capitalising the expected future net cash receipts (NCR) at its market-derived discount rate, and including the realisable value of the non-operating assets

(Madden, 1999: 65). For a single return period, the intrinsic value could thus be calculated as follows:

$$\text{Intrinsic value of the firm} = \frac{\text{NCR}}{1 + k_{\text{market}}} + \text{Realisable value of non} - \text{operating assets} \quad (3.23)$$

3.5.6.1 NCR

The NCR represents the stream of expected cash flows generated by the operating assets in future. This value is the forecasted NCR from both existing assets, as well as the NCR from future investments (Madden, 1999: 163). It is determined by considering the amount of operating assets employed in the firm, the sustainable growth rate of the assets, the level of CFROI, and the fade rate in the level of CFROI.

3.5.6.2 FADE

All firms have a certain life cycle (Madden, 1999: 18). During this time a firm attempts to generate the highest possible CFROI levels by utilising its resources effectively. However, it is usually not possible to maintain the same levels of CFROI throughout its lifetime. In those cases where a firm is generating CFROI values above the industry average it will attract other competitors. As a result of the greater competition it would become more difficult to achieve the high levels of CFROI and the firm will eventually experience a decline in its CFROI. Alternatively, if a firm is generating CFROI values below the average it will be forced to increase its value, or it could face financial failure. Hence over the long term all firms tend to fade towards the average level. The long-term average in the USA is more or less 6% (Madden, 1999: 22). The CFROI life cycle is provided in Figure 3.2:

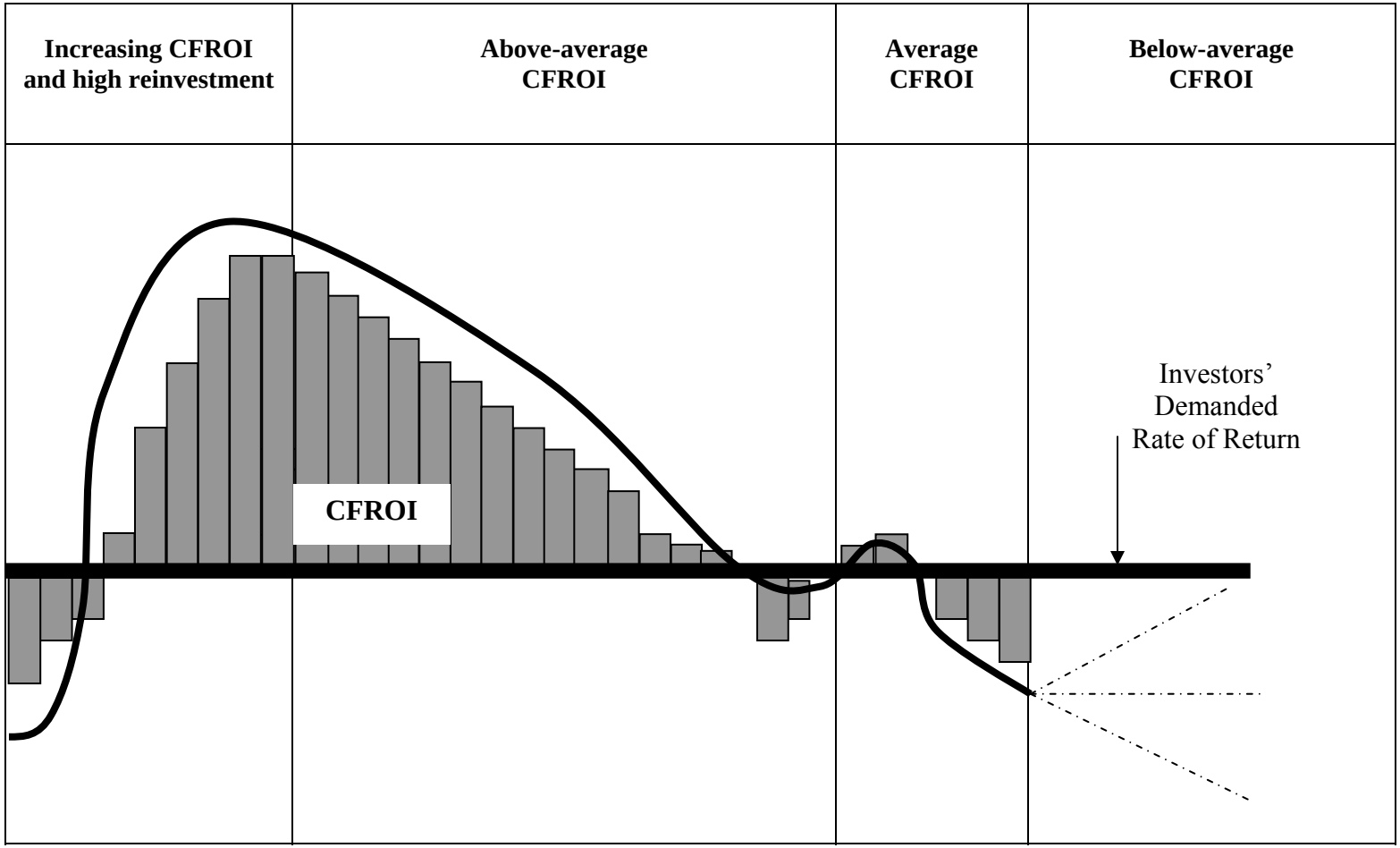


Figure 3.2: The CFROI life cycle

Source: Adopted from Madden, 1999: 20

During the first phase of the CFROI life cycle, CFROI values increase sharply. These sharp increases, combined with high levels of reinvestment, result in high levels of shareholder value creation. Consequently, competitors are attracted to the industry. As a result of the greater competition CFROI values start to decline in the second phase. Above-average levels of CFROI, however, are still maintained and shareholder value would still be created. During the third phase CFROI values are close to the investors' required return and relatively little shareholder value would be created. If the firm fails to rejuvenate its CFROI life cycle it will move into the final phase of the life cycle. CFROI levels below the investors' required rate of return result in the destruction of shareholder value. Unless it is able to increase its CFROI levels a firm would eventually face financial failure.

According to Madden (1999: 65) the rate at which CFROI values fade towards the average level is influenced by the following factors:

- *Managerial skills*. The managerial skills of the firm's management have a pronounced effect on the rate of fade. In those cases where a firm has a resourceful management team it may succeed in extending its life cycle, resulting in a slower fade rate.

- *CFROI level*. The fade rate will depend on the current level of CFROI. In those cases where relatively large CFROI values are generated the fade rate may be higher than for relatively low levels of CFROI. The reason for this lies in the attractiveness of high CFROI industries for competitors.

- *CFROI variability*. The rate at which changes in CFROI occurs also influences the fade rate. Some firms may exhibit highly variable CFROI levels and reach the average level much faster than a firm with relatively stable levels of CFROI.

- *Plough back*. The reinvestment made by the firm in its operating assets will also have an effect on its fade rate. If a firm has a high level of CFROI and it reinvests large amounts in maintaining its competitive advantage it could also achieve a lower level of fade.

3.5.7 CFROI AND SHARE RETURNS

Relatively little independent empirical research has been conducted on the relationship between CFROI and share returns. Dzamba (2003: 10) provides an overview of the use of CFROI. Based on a discussion with an analyst at HOLT Value Associates (the consulting firm that promotes CFROI) he mentions a 70% correlation between share prices and CFROI. This figure is much higher than the correlations observed for return on capital and return on equity.

Clinton and Chen (1998: 38) analyse the relationship between share prices and share returns, and a number of financial performance measures. Amongst others, CFROI are included in their study. They report that the correlation between CFROI and share prices and share returns are low, and that the measure is not able to outperform the other measures included in their study. Furthermore, they provide a warning that CFROI may be exposed to the same problem with regard to reinvestment assumptions as other rate of return measures. They also indicate that managers that are evaluated based on their CFROI levels may reject profitable investment opportunities if their expected returns are lower than current CFROI levels (Clinton & Chen, 1998: 42).

3.6 SUMMARY

In this chapter, an introduction to value based financial performance measures was provided. In the first section of the chapter the focus was placed on value based performance measures in general. These measures are presented by their proponents as an improvement over the traditional financial performance measures. They argue that the inclusion of a firm's cost of capital in their calculation enables these measures

to evaluate value creation. Furthermore, accounting adjustments are utilised in an attempt to remove some of the distortion effects of GAAP from the financial statement data used to calculate the measures. The objectives, benefits and interpretation of these measures were highlighted. Although the advocates of these measures conceive them to be superior to the traditional measures, independent research studies conducted to evaluate the different variations of the value based measures are either limited or provided inconsistent results.

In the second section of the chapter the measure of EVA was introduced. This measure represents one of the most well-known versions of the value based measures. EVA calculates the economic profit generate by a firm by comparing the cost of the invested capital with the return earned on it. In its simplest form EVA is thus considered to be a version of residual income. When calculating EVA, however, accounting adjustments to the firm's operating profit and invested capital amount are included in an attempt to remove some of the accounting distortions resulting from the application of GAAP. According to EVA proponents it is consistent with the DCF method and the maximisation of the measure should contribute to the creation of shareholder value.

A number of empirical studies investigating the relationship between EVA and shareholder value provide supporting results for these claims. A number of studies, however, also report contradictory or mixed results and question the ability of the measure to outperform the traditional financial measures in explaining the variation in share returns. From the existing literature it is, therefore, not always clear whether EVA represents an improvement over alternative measure of financial performance.

The third section of the chapter focused on the measure CVA. This measure is similar to EVA in the sense that it also attempts to quantify a firm's economic profit. Unlike EVA, however, CVA considers operating cash flow instead of operating profit. The capital charge is also calculated by considering the gross amount of invested capital by adding back the accumulated depreciation. Proponents of the measure argue that it contains all the benefits of EVA while also attempting to improve on it. The value of these improvements, however, is sometimes questioned. Very little empirical research has been conducted on the relationship between this measure and shareholder

value. The few studies that are available provide conflicting results on the relationship between CVA and shareholder returns.

The final section of the chapter considered the measure CFROI. This measure compares the inflation-adjusted cash flows generated by a firm with the inflation-adjusted cash investment required to achieve it. By including the estimated lifetime of the depreciable assets and the expected residual value of the firm's non-depreciable assets an internal rate of return is calculated and compared to the firm's inflation-adjusted cost of capital. If a firm is able to generate CFROI values in excess of its real cost of capital, it is argued that shareholder value should be created. Amongst the benefits ascribed to CFROI the focus on cash flow and the inclusion of the inflation adjustments are considered to be particularly valuable. The complexity of its calculation, and the fact that it exhibits some of the same problems associated with IRR measures, however, are mentioned as limiting factors.

An important characteristic associated with CFROI entails the fade in the value of the measure over a firm's life cycle. This is of specific importance to management, since it should attempt to extend a firm's life cycle for as long as possible. The factors influencing the fade rate include managerial skills, the level of CFROI, its variability and the level of reinvestment. Only those firms that are able to effectively manage these factors would be able to extend their life cycles and create additional shareholder value. As was the case for CVA, however, it appears that relatively little empirical research has investigated the relationship between CFROI and shareholder returns. The results from these studies also provide conflicting findings.

Based on the conflicting results reported in the empirical studies investigating the relationship between the three value based measures and share returns, it is not clear whether these measures are able to outperform the traditional financial performance measures. In the remaining chapters of this study, the focus is hence placed on evaluating the traditional and the value based financial performance measures.

Appendix 1

ADJUSTMENTS INCLUDED IN THE CALCULATION OF CFROI

This appendix provides a summary of the adjustments required in order to calculate the components of the measure cash flow return on investment (CFROI). Madden (1999: 123-135) provides a detailed discussion on the adjustments that are included when calculating a firm's CFROI value.

This appendix consists of four sections. The first section focuses on the calculation of the inflation-adjusted total assets of the firm. This amount consists of the inflation-adjusted depreciating assets, which are discussed in section two, and the inflation-adjusted non-depreciating assets, which are highlighted in section three. The final section contains the adjustments included in the calculation of the inflation-adjusted gross cash flows.

1.1 INFLATION-ADJUSTED TOTAL ASSETS

The inflation-adjusted total assets amount is calculated as the total of the depreciating and the non-depreciating inflation-adjusted assets.

Inflation-adjusted total assets	=	Inflation-adjusted depreciating assets + Inflation-adjusted non-depreciating assets

The calculation of the inflation-adjusted depreciating and non-depreciating assets amounts are discussed in the next two sections.

1.2 INFLATION-ADJUSTED DEPRECIATING ASSETS

According to Madden (1999: 123) the inflation-adjusted depreciating assets amount is calculated as follows:

Current cost depreciating assets	=	Inflation-adjusted Gross Plant + Construction in Progress + Inflation-adjusted Gross Leased Property + Adjusted Intangibles

The different components of the inflation-adjusted depreciating assets identified above are calculated as follows:

- **INFLATION-ADJUSTED GROSS PLANT**

The balance sheet value for the depreciating PPE represents the historical cost of these items. When calculating CFROI, however, current cost figures are used. An inflation adjustment is, therefore, required. Ideally, each historical value should be adjusted individually by considering changes in the purchasing power of money over its lifetime. The complete data on exactly when items were purchased, however, is seldom available, and the process may also prove to be too complex. Madden (1999: 253) suggests an estimation procedure where the asset life, real growth rate of the assets, and inflation deflators are applied to calculate an inflation adjustment factor.

- **CONSTRUCTION IN PROGRESS**

The CIP amount does not need to be adjusted for inflation, since most of the items are shown at current replacement values in the balance sheet. The reason why these items (which are not currently subjected to depreciation) are included with the other depreciating assets is that they will be depreciated in future (Madden, 1999: 118).

- **INFLATION-ADJUSTED GROSS LEASED PROPERTY**

Property obtained under a lease agreement is not included in the balance sheet, and only a rental expense is subtracted in the income statement. However, since these assets are employed to generate cash flow, they should be included with the rest of the depreciating assets (Madden, 1999: 119). The adjustment suggested is to capitalise the operating leases and to include the item as an asset. The corresponding value should be included under the debt of the firm, and the rental expense subtracted in the income statement should be added back.

- **GOODWILL**

The treatment of goodwill when calculating CFROI presents a major problem. Depending on the expected future actions of a firm, it could either be included with the depreciating assets, or excluded. The database compiled by HOLT Value Associates includes calculations of CFROI with and without the inclusion of intangibles (Madden, 1999: 122). Their proposed treatment of goodwill is to apply pooling accounting and to indicate the amount of goodwill as a footnote.

- **ADJUSTED INTANGIBLES**

Some items included in the balance sheet (pension intangibles, for instance) are created as a result of an accounting entry. These types of items should not be included in the calculation of CFROI, since they cannot contribute to the firm's cash flow, and are consequently excluded from the depreciating asset amount.

1.3 INFLATION-ADJUSTED NON-DEPRECIATING ASSETS

The inflation-adjusted non-depreciating assets are included in the total asset figure invested at the beginning of the estimated asset lifetime. At the end of the asset lifetime this value represents a cash inflow. The non-depreciating assets consist of (Madden, 1999: 132):

Current cost non-depreciating assets	=	Monetary assets – Adjusted current liabilities + Investments and loans granted + Current cost inventories + Current cost land and improvements

- **NET MONETARY ASSETS**

The net monetary asset amount is the difference between the monetary assets and the adjusted current liabilities. The monetary assets consist of cash, short-term investments, trade and other receivables, and other current assets.

The adjusted current liabilities include the trade and other payables, tax payable, dividends payable, accrued expenses, as well as all other liabilities not considered as debt holders in the firm. Since CFROI calculates the return offered to all the capital providers of the firm, the debt holders are excluded from the current liabilities. Examples of these include any short-term debt and the current portion of long-term liabilities (Madden, 1999: 129).

- **INVESTMENTS AND LOANS GRANTED**

The classification of investments and loans granted depends on their contribution to the firm's total assets. In those cases where it constitutes only a small portion of the total assets it can be classified as a non-depreciating asset (Madden, 1999: 131).

- **CURRENT COST INVENTORIES**

If a firm values its inventories according to the First-In-First-Out (FIFO) approach, the final value of the inventories in the balance sheet is representative of the most recent purchase price. Adjustments to make provision for higher replacement values are thus unnecessary. If the Last-In-First-Out (LIFO) approach is applied, however, an adjustment needs to be made to the balance sheet value. By including the LIFO reserve with the balance sheet value of the inventories, the balance sheet value is adjusted for the effect of inflation (Madden, 1999: 130).

- **CURRENT COST LAND AND IMPROVEMENTS**

The historical cost of the land and improvements are adjusted using a similar approach as for the gross plant.

1.4 INFLATION-ADJUSTED GROSS CASH FLOW

This amount should be a reflection of the total cash flow generated by the firm's operations, and ignores the method of financing. The amount is calculated as follows (Madden, 1999: 133):

	Net profit after tax
+	Depreciation and amortisation
+	Adjusted finance cost
+	Rental expense
+ / -	Monetary holding gain / (loss)
-	Cost of sales adjustment for replacement value of inventories
+	Net pension expense
+	Minority interest
+	Special item after tax
=	**INFLATION-ADJUSTED GROSS CASH FLOW**

- **DEPRECIATION AND AMORTISATION**

Since the depreciation and the amortisation (non-cash flow items) have been subtracted from the net profit after tax, they need to be added back when calculating the cash flow figure.

- **ADJUSTED FINANCE COST**

The finance cost subtracted in the income statement is not part of the firm's operating costs, and is added back. In those cases where the results from a financial subsidiary are included in the financial statements of a firm, the finance cost associated with the subsidiary needs to be excluded from the finance cost figure. Capitalised finance costs are also excluded from the finance cost figure (Madden, 1999: 133).

The adjusted finance cost is therefore:

Adjusted finance cost	=	Gross finance cost - capitalised finance cost - financial subsidiary finance cost

- **RENTAL EXPENSE**

Since operating leases are capitalised and included in the balance sheet as an asset, the rental expenses need to be added back to the net profit after tax figure.

- **MONETARY HOLDING GAIN / LOSS**

In the case where a firm exhibits a positive net monetary holding, it needs to make an adjustment to ensure that its cash flow is in real terms. It will be exposed to a monetary holding loss. The reason for this adjustment is to ensure that the purchasing power of the firm's principal is maintained. In the case of a negative net monetary holding, the opposite would occur. The firm will be able to redeem its liabilities with cash with reduced purchasing power. This will result in a monetary holding gain (Madden, 1999: 134).

- **COST OF SALES ADJUSTMENT: INVENTORIES**

If a firm applies the FIFO approach to value its inventories its cost of sales does not make provision for the higher replacement value of the inventories. Applying the LIFO approach yields a more accurate cost of sales amount (Madden, 1999: 135). An adjustment is, therefore, suggested to ensure that the cost of sales figure is inflation-adjusted.

- **MINORITY INTEREST**

The minority shareholders are treated as capital suppliers when applying the CFROI valuation approach. Since the amount of minority interest is subtracted in the income statement, this figure needs to be added back when calculating the cash flow available to all the capital providers.

Chapter 4

RESEARCH METHOD

4.1 INTRODUCTION

The objective of this study is to investigate a number of traditional and value based financial performance measures. For this purpose, a similar approach to the one applied by Biddle *et al*. (1997) is used to evaluate the relative and incremental information content of the various measures.

This chapter provides a description of the research method employed in the study. The remainder of this chapter consists of six sections. The first section contains the hypotheses of the study. The second section introduces the statistical techniques applied to test the research hypotheses. The third section provides the breakdowns of the various measures into their contributing components that are required for the relative and incremental information contents tests. A distinction is made between nominal and inflation-adjusted measures, and the inflation adjustments included in the calculation of the real measures are also highlighted. The fourth section focuses on the calculation of the dependent and independent variables, while the fifth section describes the sample selection. The final section provides a summary.

4.2 HYPOTHESES

The information content of a financial measure refers to the additional information that the market deduces from its publication and incorporates into the expected future financial performance of the firm. In order to evaluate the relative and incremental information content of the traditional and the value based measures included in this study, an approach developed by Biddle *et al*. (1997: 307) is applied. According to

this approach, relative information content comparisons should be used to compare different measures, or when a choice between the measures is required. Incremental information content is used to determine whether one component of a measure provides additional information over and above that provided by another component.

To investigate the relative information content of the measures, the following null hypothesis is formulated (Biddle *et al*., 1997: 308):

H_{REL}: The information content of measure X_1 is equal to that of X_2

where X_1 and X_2 are pairwise combinations of the measures under investigation. Rejection of the null hypothesis indicates a statistically significant difference in the information content of the two measures.

In order to investigate the incremental information content of the components of measure X_i, it is necessary to decompose it into its contributing components:

$$X_i = Y_1 + Y_2 + Y_3 + \ldots + Y_n$$

The following null hypothesis is then formulated (Biddle *et al*., 1997: 308):

H_{INC}: Component Y_1 does not provide information content beyond that provided by the remaining components Y_2-Y_n

where Y_1-Y_n are the various components of the measure X_i investigated. Pairwise comparisons of the components are conducted to evaluate the incremental information content. Rejection of the null hypothesis indicates that the inclusion of the component under investigation will contribute significant additional information content.

4.3 STATISTICAL TECHNIQUES

In order to evaluate the information content of the measures, the relationships between the measures and market adjusted share returns are investigated. For this purpose, regression analyses with the share return as dependent variable and the various measures as the independent variables are conducted. The statistical technique employed in this study focuses on the forecast errors of the various measures (calculated as the difference between the actual and expected values), which are standardised to size.

When assessing the information content of a measure, the statistical significance of the slope coefficient b_1 from the following ordinary-least squares regression is examined (Biddle *et al*., 1997: 308):

$$D_t = b_0 + b_1 FE_{Xt} / \text{MVE}_{t-1} + e_t \quad (4.1)$$

where D_t (the dependent variable) is a measure of return for time period t; $FE_{Xt} / \text{MVE}_{t-1}$ is the unexpected realisation (or forecast error) of the measure X (FE_{Xt}), divided by the market value of the firm's equity at the beginning of the financial year (MVE_{t-1}); while e_t is a random disturbance term.

The unexpected realisation of the measure X for time period t is defined as the difference between the observed value of the measure (X_t) and the market's expected value of the measure ($\text{E}(X_t)$):

$$FE_{Xt} = X_t - \text{E}(X_t) \quad (4.2)$$

Assuming that the market's expected value is formed according to a discrete linear stochastic process in autoregressive form, $\text{E}(X_t)$ may be defined as:

$$\text{E}(X_t) = \delta + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \phi_3 X_{t-3} + \ldots \quad (4.3)$$

where δ is a constant and the ϕ's are the autoregressive parameters. Substituting Equations (4.2) and (4.3) into Equation (4.1) yields:

$$\begin{aligned} D_t &= b_0 + b_1 [X_t - (\delta + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \phi_3 X_{t-3} + \ldots)] / \text{MVE}_{t-1} + e_t \\ &= b_0' + b_1' X_t / \text{MVE}_{t-1} + b_2' X_{t-1} / \text{MVE}_{t-1} + b_3' X_{t-2} / \text{MVE}_{t-1} \\ &\quad + b_4' X_{t-3} / \text{MVE}_{t-1} + \ldots + e_t \end{aligned} \quad (4.4)$$

where $\text{E}(b_0') = b_0 - b_1 \delta$, $\text{E}(b_1') = b_1$, and $\text{E}(b_i') = -b_i \phi_{i-1}$ for $i > 1$. Equation (4.4) provides the relationship between abnormal returns (D_t), and the lagged measures of accounting performance (X) scaled by MVE. For the purpose of this study, Equation (4.5) is limited to one lag:

$$D_t = b_0' + b_1' X_t / \text{MVE}_{t-1} + b_2' X_{t-1} / \text{MVE}_{t-1} + e_t \quad (4.5)$$

4.3.1 TESTS FOR RELATIVE INFORMATION CONTENT

The relative information contents of the measures are assessed by means of a statistical test developed by Biddle, Seow and Siegel (1995: 9). The independent variables are included in individual regressions against the dependent variable based on the following equation:

$$D_t = b_0' + b_1' X_t / \text{MVE}_{t-1} + b_2' X_{t-1} / \text{MVE}_{t-1} + e_t \quad (4.6)$$

where D_t is the market-adjusted return on a firm's shares for time period t, X is one of the measures investigated, and MVE is the market value of the firm's equity.

According to the test, pairwise comparisons of the adjusted R^2 values from the individual regressions are conducted. Statistically significant differences between two adjusted R^2 values result in the rejection of the null hypothesis H_{REL}. This indicates a statistically significant difference in the ability of the two measures under

investigation to explain the variation in the dependent variable (Biddle *et al*., 1997: 310).

4.3.2 TESTS FOR INCREMENTAL INFORMATION CONTENT

In order to evaluate the incremental information content of the components of the measures investigated in this study, the following regression is conducted (Biddle *et al*., 1997: 311):

$$D_t = d_0 + d_1 Y_{1;t} / \text{MVE}_{t-1} + d_2 Y_{1;t-1} / \text{MVE}_{t-1} + d_3 Y_{2;t} / \text{MVE}_{t-1} + d_4 Y_{2;t-1} / \text{MVE}_{t-1} + e_t \quad (4.7)$$

where Y_1 and Y_2 are two different components of the measure under investigation. The individual regression coefficients are assessed by means of *t*-tests to investigate the contribution of the specific component. *F*-tests are used to assess the following joint null hypotheses:

$$H_{0Y_1}: \; d_1 = d_2 = 0$$

$$H_{0Y_2}: \; d_3 = d_4 = 0$$

Rejection of the null hypotheses indicates that the inclusion of a component provides significant incremental information.

4.4 COMPONENTS OF THE MEASURES

This study investigates the relative and incremental information content of the measures cash flow return on investment (CFROI), nominal and inflation-adjusted cash value added (CVA_{nom} and CVA_{real}), nominal and inflation-adjusted economic value added (EVA_{nom} and EVA_{real}), operating cash flow (CFO), earnings before extraordinary items (EBEI) and residual income (RI). To do so, these measures are

partitioned into their contributing components using an approach applied by Biddle *et al*. (1997: 305).

The following section provides a break-down of the components included in the calculation of the nominal versions of the measures included in the study. Thereafter, the inflation adjustments proposed by International Accounting Standard 15 (IAS15) are highlighted. Finally, the components of the inflation-adjusted measures EVA_{real}, CVA_{real} and CFROI are considered.

4.4.1 NOMINAL MEASURES

To explore the relationships between the various measures, one should commence by defining EBEI, and then discuss all the additional components required to calculate the measures. According to Biddle *et al*. (1997: 305) a firm's EBEI could be defined as follows:

$$EBEI_t = CFO_t + Accrual_t, \quad (4.8)$$

where:

$EBEI_t$ = The earnings before extraordinary items and tax for period *t*.
CFO_t = The net cash from operating activities.
$Accrual_t$ = The total operating accruals of the firm.

The difference between EBEI and the net operating profit after tax (NOPAT) is that NOPAT does not take the after-tax interest expense into account, while EBEI does. Therefore:

$$NOPAT_t - ATInt_t = EBEI_t \quad (4.9)$$

where:

$ATInt_t$ = Interest expense after provision for tax

While EBEI makes provision for the cost of debt by subtracting the interest expense, RI is calculated by deducting the cost of the total (i.e. debt and equity) capital.

$$RI_t = NOPAT_t - (c^* \times IC_{t-1}) \quad (4.10)$$

where:

c^* = The firm's estimated weighted average cost of capital (WACC) after tax

IC_{t-1} = The amount of capital invested in the firm at the beginning of the period

Firms that achieve positive RI values are able to generate profits in excess of their total cost of capital, and consequently shareholder value should be created. Negative RI values are an indication that insufficient profits are generated, and as a result, shareholder value could be destroyed.

EVA is calculated in a similar way as RI. The major difference between the two measures relates to a number of adjustments to NOPAT and IC included in the calculation of EVA. These adjustments are included with a view to removing some of the accounting distortions identified by Stewart (1991: 28).

$$EVA_t = (NOPAT_t + AcctAdj_{op;\ t}) - [c^* \times (IC_{t-1} + AcctAdj_{c;\ t})] \quad (4.11)$$

where:

$AcctAdj_{op;\ t}$ = Adjustments to remove the accounting distortions from operating profit

$AcctAdj_{c;\ t}$ = Adjustments to remove the accounting distortions from invested capital

Since EVA values are not published by Stern Stewart for South African firms, the EVA values are obtained from the McGregor BFA database (2005). Although these EVA values do not include all the adjustments recommended by Stern Stewart, the standardisation process applied to the financial statements contained in the database already makes provision for a number of the adjustments.

A firm's CVA is calculated by considering the operating cash flow rather than operating profit (as was the case for EVA), and subtracting the gross capital charge. To convert NOPAT into the operating cash flow, depreciation and amortisation are added back (Martin & Petty, 2000: 128). Changes in other long-term liabilities, such as provisions and deferred taxes, are also added to NOPAT to convert it into a cash flow figure (Young & O'Byrne, 2001: 441). The capital charge is based on the gross value of the invested capital and not on the net figure (Martin & Petty, 2000: 141). Accumulated depreciation is, therefore, added back to the invested capital.

$$\begin{aligned} CVA_t &= \text{Operating cash flow –gross capital charge} \\ &= (NOPAT_t + CVAAdj_{op;\ t}) - [c^* \text{ x } (IC_{t\text{-}1} + AccDepr_{t\text{-}1})] \end{aligned} \tag{4.12}$$

where:

$CVAAdj_{op;\ t}$ = Depreciation, amortisation and changes in other long-term liabilities

$AccDepr_{t\text{-}1}$ = Accumulated depreciation

Based on these definitions CVA can be presented as follows:

$$CVA = CFO + Accrual + ATInt - CapChg + AcctAdj + CVAAdj$$

where:

$CapChg = c^* \text{ x } IC_{t\text{-}1}$

$AcctAdj = AcctAdj_{op;\ t} - (c^* \text{ x } AcctAdj_{c;\ t})$

$CVAAdj = CVAAdj_{op;\ t} - AcctAdj_{op;\ t} + [c^* \text{ x } (AcctAdj_{c;\ t} + AccDepr_{t\text{-}1})]$

The relationship between the CVA components is summarised in Figure 4.1 (Biddle *et al*., 1997: 307):

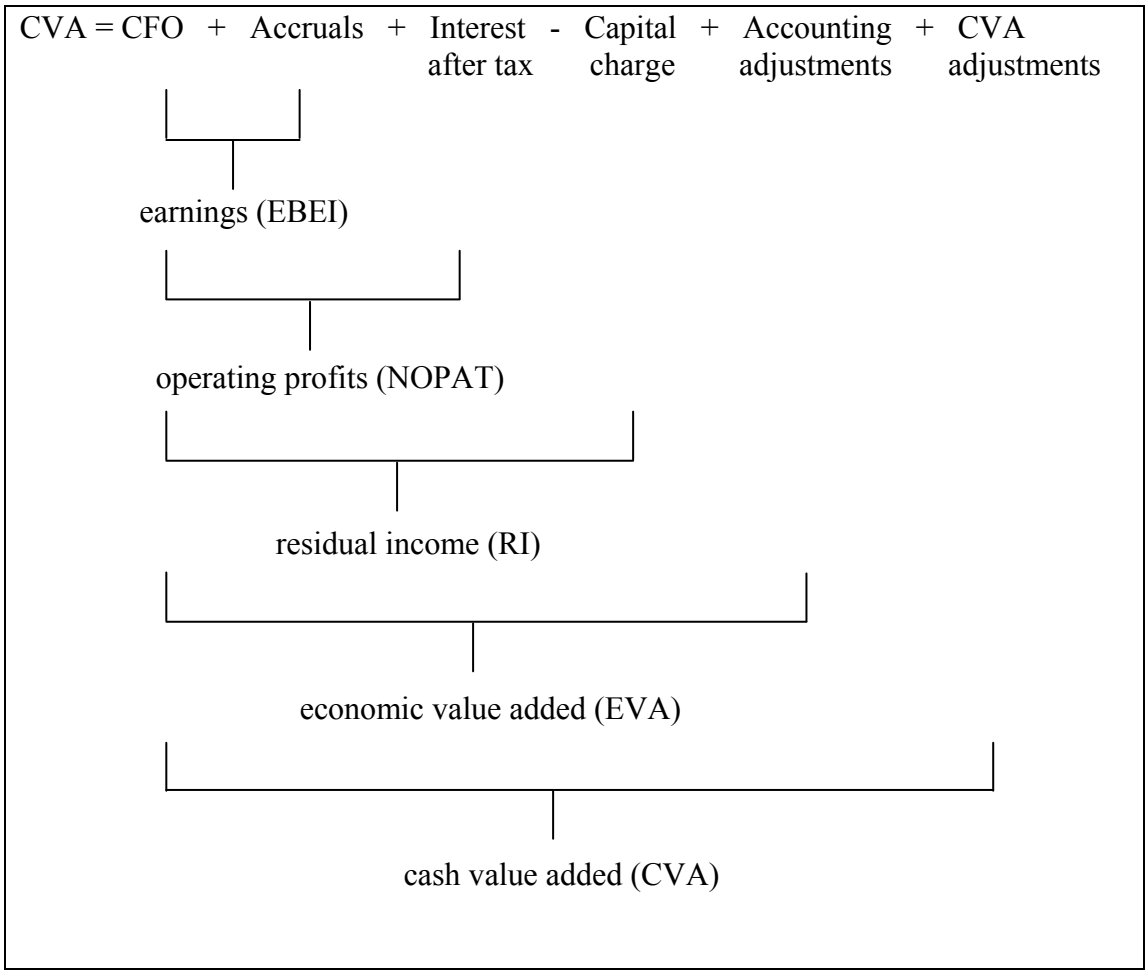


Figure 4.1: Components of cash value added (CVA)

4.4.2 INTERNATIONAL ACCOUNTING STANDARD 15 (IAS15) INFLATION ADJUSTMENTS

In addition to the nominal measures, this study also investigates the information content of the inflation-adjusted versions of EVA and CVA. In order to calculate the inflation-adjusted versions of these measures, inflation adjustments are calculated according to the guidelines contained in IAS15. These guidelines recommend

adjustments to the cost of sales, the depreciation, the level of gearing, and the property, plant and equipment (PPE). The adjustments are calculated as follows:

4.4.2.1 COST OF SALES ADJUSTMENT

The operating profit reflected in the income statement of a firm is usually calculated in nominal terms and no adjustments are made to reflect the effect of changing prices. Inventory plays an important role in determining a firm's cost of sales, since the opening and closing inventory values are included in its calculation. Inventory, however, is influenced by inflation and a firm needs to make provision for its higher replacement value when calculating the cost of sales. Failure to do so could result in a decrease in capital. Consequently, it is necessary to include a cost of sales adjustment in the operating profit. The following formula is applied:

$$COSAdj_t = Inv_{t-1} \times \left(\frac{Infl_{t-1}}{Infl_{t-\frac{1}{2}}} - 1 \right) + Inv_t \times \left(1 - \frac{Infl_{t-\frac{1}{2}}}{Infl_t} \right) \quad (4.13)$$

where:

$COSAdj_t$	=	the cost of sales adjustment for time period t
Inv_t	=	the inventory
$Infl_t$	=	a suitable inflation index, measured at the beginning, middle and end of the financial year

During periods of inflation this adjustment is subtracted from the operating profit, since it indicates the increase in the cost of sales required to make provision for the higher replacement value of the items sold.

4.4.2.2 DEPRECIATION ADJUSTMENT

In most cases the depreciation amount included in the calculation of NOPAT is based on the straight-line depreciation of the historic cost of assets included in the balance sheet. No provision, therefore, is made for the current replacement value of these assets. In order to calculate an inflation-adjusted version of the measures EVA and CVA a depreciation adjustment based on the replacement value of the assets is required. This adjustment is calculated by first estimating the average age of the PPE and then adjusting the depreciation by the change in inflation since the estimated acquisition date of the PPE.

$$\text{Average age of PPE} = \frac{\text{Accumulated depreciation}}{\text{Depreciation for the current year}} \tag{4.14}$$

Based on the average age the estimated acquisition date of the PPE is determined. By comparing the value of an inflation index on this date with its current value the depreciation figure is adjusted as follows:

$$\text{DeprAdj}_t = \text{Depreciation}_t \text{ x } \left(\frac{\text{Infl}_t}{\text{Infl}_{\text{acquisition}}} - 1 \right) \tag{4.15}$$

where:

DeprAdj_t = the depreciation adjustment
Depreciation_t = the depreciation for the current financial year
$\text{Infl}_{\text{acquisition}}$ = the inflation index measured on the estimated acquisition date

The depreciation adjustment represents the additional depreciation that needs to be provided on the PPE and is subtracted from NOPAT during periods of inflation.

4.4.2.3 GEARING ADJUSTMENT

The capital structures of most firms consist of a combination of equity and debt capital. When considering the effect of inflation on the financial performance of the firm it is important to focus on the different influence it exerts on these two types of financing. In the case of equity the inflation risk is carried by the firm itself and it needs to make provision for the higher replacement value of the capital in future. In the case of debt capital, however, the capital providers are exposed to the decreasing purchasing value of the debt capital.

When calculating the inflation gearing adjustment a distinction needs to be made between a net monetary asset situation, where the firm finances the majority of its capital, and a net monetary liability situation, where debt providers carry the bulk of the inflation risk. Monetary assets consist of cash and all items that would result in cash inflows. Monetary liabilities are all amounts payable in cash. Depending on the type of situation prevalent in the firm the gearing adjustment may be calculated based on the following formulae:

Net monetary asset situation:

$$GearAdj_{asset;t} = NetMonAsset_t \text{ x } \left(\frac{Infl_t}{Infl_{t-1}} - 1 \right) \quad (4.16)$$

Net monetary liability situation:

$$GearAdj_{liab;t} = \left(\frac{NetMonLiab_t}{NetMonLiab_t + NonMonLiab_t + PPEAdj_t} \right) \text{ x } \left(COSAdj_t + DeprAdj_t \right) \quad (4.17)$$

where:

$GearAdj_{asset;t}$ = the gearing adjustment for a net monetary asset situation
$GearAdj_{liab;t}$ = the gearing adjustment for a net monetary liability situation
$NetMonAsset_t$ = the net monetary assets

$NetMonLiab_t$ = the net monetary liabilities
$NonMonLiab_t$ = the non-monetary liabilities
$PPEAdj_t$ = inflation adjustment to PPE

In the case of a net monetary asset situation the operating profit needs to be reduced by the adjustment amount in order to make provision for the higher replacement value of the capital. Under a net monetary liability situation the operating profit is increased by the gearing adjustment amount to reflect the inflation risk absorbed by the debt capital providers.

4.4.2.4 INFLATION ADJUSTMENT TO PROPERTY, PLANT AND EQUIPMENT

The PPE value indicated in a balance sheet usually includes only the historical book value of the items and does not represent the current replacement value of these items. When calculating the capital charge based on balance sheet values no provision is made for the higher replacement value of the PPE and as a result EVA and CVA may be overstated. This could be solved by estimating the current replacement value of the PPE and including it in the calculation of EVA_{real} and CVA_{real}.

$$PPEAdj_t = PPE_{nom;t} \times \left(\frac{Infl_t}{Infl_{acquisition}} - 1 \right) \quad (4.18)$$

where:

$PPEAdj_t$ = the inflation adjustment to the PPE
$PPE_{nom;t}$ = the nominal carrying value of the PPE

4.4.2.5 COST OF CAPITAL

When calculating EVA_{real} and CVA_{real} the nominal cost of capital should be adjusted to reflect the effect of inflation. The inflation-adjusted cost of capital is calculated as follows:

$$c^*_{real} = \left(\frac{1 + c^*_{nom}}{1 + Infl_{year}}\right) - 1 \quad (4.19)$$

where:

c^*_{real} = the inflation-adjusted cost of capital

c^*_{nom} = the nominal cost of capital

$Infl_{year}$ = the change in the inflation index during the financial year

4.4.3 INFLATION-ADJUSTED EVA AND CVA, AND CFROI

After calculating the IAS15 inflation adjustments, the inflation-adjusted version of the measure EVA is calculated as follows:

$$EVA_{real;t} = NOPAT_{real;t} - (IC_{real;t\text{-}1} \times c^*_{real;t}) \quad (4.20)$$

$$= (NOPAT_{nom;t} - COSAdj_t - DeprAdj_t \pm GearAdj_t) - [(IC_{nom;t\text{-}1} + PPEAdj_t) \times c^*_{real;t}] \quad (4.21)$$

where:

$EVA_{real;t}$ = EVA in real terms, calculated after the inflation adjustments to NOPAT and IC, are included

$NOPAT_{real;t}$ = NOPAT after including the cost of sales, depreciation and gearing adjustments

$c^*_{real;t}$ = the inflation-adjusted cost of capital

$IC_{real;t\text{-}1}$ = the invested capital after including the PPE inflation adjustment

The real CVA is then calculated as follows:

$$CVA_{real;\,t} = (NOPAT_{nom;\,t} + CVAAdj_{op;\,t} - COSAdj_t - DeprAdj_t \pm GearAdj_t) - [c^*_{real} \times (IC_{nom;\,t\text{-}1} + PPEAdj_t + AccDepr_{t\text{-}1})] \quad (4.22)$$

where:

$CVA_{real;\,t}$ = CVA in real terms, calculated after the inflation adjustments to NOPAT and capital, are included

$CVAAdj_{op;\,t}$ = Depreciation, amortisation and changes in other long-term liabilities

$AccDepr_{t\text{-}1}$ = Accumulated depreciation

The measure cash flow return on investment (CFROI) compares the inflation-adjusted cash flow generated by a firm with the inflation-adjusted cash investment required to achieve it (Young & O'Byrne, 2001: 382). By including the estimated lifetime of the firm's depreciable assets and the expected residual value of its non-depreciable assets an internal rate of return is calculated. This CFROI figure is then compared to the firm's inflation-adjusted (real) cost of capital.

In order to investigate the relative and incremental information content of the measure and to compare it with the other measures included in this study the CFROI margin is defined as the difference between a firm's CFROI and its real cost of capital:

$$CFROI_{Margin} = CFROI - c^*_{real} \quad (4.23)$$

The CFROI margin can be presented as follows:

$$CFROI_{Margin} = CFO + Accrual + ATInt - CapChg + AcctAdj + InflAdj + CVAAdj_{real} + CFROIAdj$$

where:

$$\text{CapChg} = c^{*}_{nom} \text{ x } IC_{t\text{-}1}$$

$$\text{AcctAdj} = \text{AcctAdj}_{op} - (c^{*}_{nom} \text{ x } \text{AcctAdj}_{c})$$

$$\text{InflAdj} = (\text{GearAdj} - \text{COSAdj} - \text{DeprAdj}) - \left[\left(\frac{\text{Infl}_{year}\left(c^{*}_{nom}+1\right)}{1+\text{Infl}_{year}} \text{ x } IC_{t-1}\right) + \left(\frac{\text{Infl}_{year}\left(c^{*}_{nom}+1\right)}{1+\text{Infl}_{year}} \text{ x } \text{AcctAdj}_{c}\right) + \left(c^{*}_{real} \text{ x } \text{PPEAdj}\right)\right]$$

$$\text{CVAAdj}_{real} = (\text{CVAAdj}_{op} - \text{AccAdj}_{op}) - [c^{*}_{real} \text{ x } (\text{AccDepr} - \text{AccAdj}_{c})]$$

$$\text{CFROIAdj} = \text{CFROI}_{Margin} - \text{CVA}_{real}$$

The relationship between the CFROI_{Margin} components is summarised in Figure 4.2 (Biddle *et al*., 1997: 307):

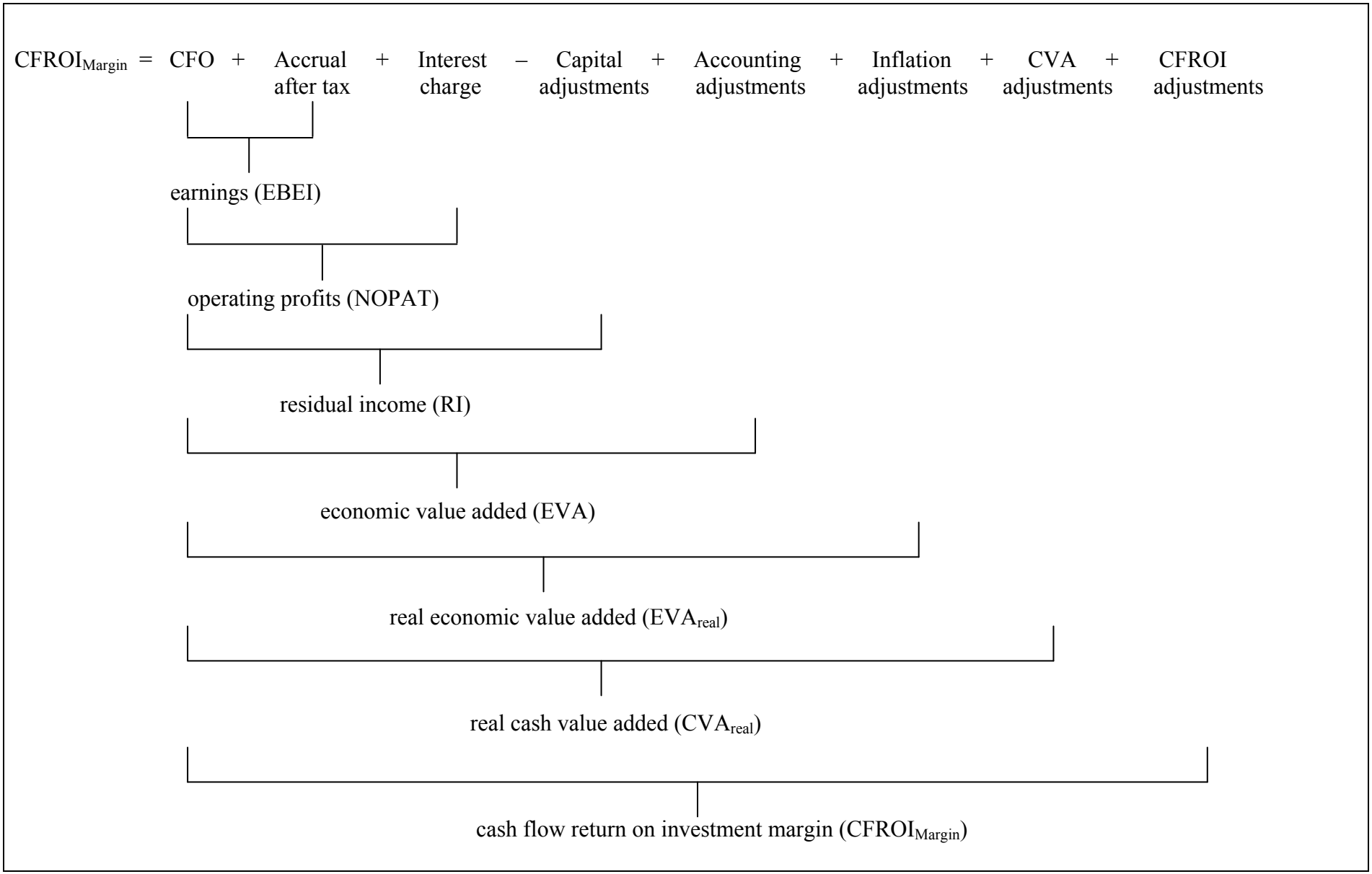


Figure 4.2: Components of cash flow return on investment margin (CFROI$_{Margin}$)

4.5 MEASURES

4.5.1 DEPENDENT VARIABLE

The relative and incremental information content tests applied in this study focus on the relationship between the independent variables and the unexpected return generated on a firm's shares. In order to estimate the unexpected return, the market adjusted return is calculated (Biddle *et al*., 1997: 312). This value indicates whether a firm over- or under performed relative to the overall market.

MktAdjRet The market adjusted return is calculated as the difference between the 12-month compounded return on a share and the 12-month compounded return on the ALSI index. These returns are calculated for a period ending three months after the end of a firm's financial year-end to ensure that the information contained in the financial statements is reflected in the share prices.

The 12-month compounded share returns, as well as the return on the ALSI index, are obtained from the McGregor BFA database (2005). Appendix 2 contains an example of the calculation of the market adjusted return for Pick&Pay based on the firm's financial statements for 2004.

4.5.2 INDEPENDENT VARIABLES

The primary objective of this study is to investigate the relative and the incremental information content of a number of traditional and value based financial performance measures. The measures included in the relative information content test are CFO, EBEI, RI, EVA, and CVA, as well as the inflation-adjusted measures EVA_{real}, CVA_{real} and CFROI. The measures are calculated based on information obtained from the standardised financial statement data contained in the McGregor BFA database (2005).

Stern Stewart does not publish EVA values for South African firms. The McGregor BFA database (2005), however, contains EVA values that are calculated based on the standardised financial statements included in the database. Through the standardisation process applied by the database the majority of the EVA accounting adjustments are addressed. The equity adjustments proposed by Stern Stewart, however, are not included in the EVA values reported in the database.

In the case of firms listed at the end of the research period, values for EVA, cost of capital and invested capital are obtained from the McGregor BFA database (2005). Since these values are not available for those firms that delisted during the period under review, they are estimated using the same method as the one employed in the database. The calculations of the nominal measures are illustrated in Appendix 2, which contains the calculation of the measures based on the 2004 financial statements of Pick&Pay. The procedure used to estimate the values of EVA, cost of capital and invested capital for the delisted firms are also provided in Appendix 2.

In order to evaluate the effect of inflation on the measures, the inflation adjustments proposed by IAS15 are quantified and included in the calculation of EVA_{real} and CVA_{real}. Appendix 3 contains the calculation of the IAS15 inflation adjustments based on the 2004 financial statements for Pick&Pay. The corresponding values of the measures EVA_{real} and CVA_{real} are also provided.

CFROI values are not available from the McGregor BFA database (2005). Consequently, these values are estimated by using the approach described by Madden (1999). In order to illustrate the calculation of CFROI, Appendix 4 estimates the 2004 CFROI value for Pick&Pay.

In order to evaluate the incremental information content of the components of the measures EVA, EVA_{real}, CVA, CVA_{real} and CFROI, the components indicated in Figure 4.1 and Figure 4.2 are required. These calculations of these components are illustrated in Appendix 2 (Accrual, ATInt, CapChg, AcctAdj and CVAAdj), Appendix 3 (InflAdj, $CVAAdj_{real}$) and Appendix 4 (CFROIAdj).

To reduce heteroscedasticity in the data, all the independent variables are divided by the market value of equity as measured three months after the beginning of the firm's financial year (MVE_{t-1}) (Biddle *et al*., 1997: 313). This period is chosen to correspond with the period over which the dependent variable is calculated.

4.6 DATA

The research covers 15 years, from 1991 to 2005. All firms listed in the Industrial Sector of the Johannesburg Securities Exchange (JSE) during this period are included in the sample. Those firms listed at the end of this period are considered for the initial sample. Focusing only on these firms, however, would expose the study to a survivorship bias. Consequently, all delisted firms that were listed during the period under investigation are also included in the sample. A total of 198 listed firms and 188 delisted firms are identified.

The research method requires complete data to calculate the values of the measures for at least two consecutive years, and only those firms that provided this information are considered for inclusion in the final sample. After the exclusion of 22 firms that did not provide the complete required data, a total of 364 firms with 3181 observations were included. The names of the firms included in the sample are provided in Appendix 4.

Following Biddle *et al*. (1997: 311), those observations in excess of eight standard deviations from the median are classified as extreme outliers. These extreme outliers are removed from the sample. The number of observations classified as extreme outliers relative to the overall sample is relatively small. A closer investigation of those firms classified as extreme outliers also reveals that the majority of these values are observed for firms at the end of their lifecycle, where financial performance is diminishing, and share prices have already collapsed. Other examples include the first financial year of firms that listed for the first time, or firms that underwent financial reorganisation.

Both the dependent and independent variables are also winsorised to ± four standard deviations from the median. Different information is required for the measures investigated in this study. As a result, the number of firms and observations vary from measure to measure.

4.7 SUMMARY

This chapter focused on the research method that is applied in the study. The first section of the chapter contained the research hypotheses required to evaluate the relative information content of the different measures, as well as the incremental information content provided by their contributing components. In order to test these research hypotheses, a statistical test developed by Biddle, Seow and Siegel (1995) is applied. In the case of the relative information content tests the rejection of the null hypothesis indicates a statistically significant difference in the information content of two different measures. The rejection of the null hypothesis formulated for the incremental information content tests indicate that the inclusion of a specific component of the measure under investigation provides significant incremental information beyond that contained in the remaining components.

A detailed description of the calculation of the measures included in this study was also provided. The measures cash from operations, earnings before extraordinary items, residual income, nominal and inflation-adjusted economic value added, nominal and inflation-adjusted cash value added, and cash flow return on investment are evaluated in the relative information content tests. In order to evaluate the incremental information content of the components of these measures, they are decomposed into their contributing components.

The measures are calculated based on financial information obtained from the McGregor BFA database (2005). The market-adjusted return on a firm's shares is calculated as the dependent variable. The calculation of the independent variables, their components, as well as a number of inflation adjustments are discussed in great detail. The study is conducted for the 15 year period covering 1991 to 2005.

In the remaining chapters of the study the information content of the traditional and value based measures will be investigated. Chapter 5 focuses on the measure EVA, while Chapter 6 evaluates the inflation-adjusted values of EVA after the inclusion of the IAS15 inflation adjustments. Chapter 7 considers the nominal and inflation-adjusted versions of the measure CVA, while CFROI is evaluated in Chapter 8.

Appendix 2

CALCULATION OF THE MEASURES CFO, EBEI, RI, EVA AND CVA

This appendix provides an overview of the calculations completed in order to investigate the relative and incremental informational contents of the measures cash from operations (CFO), earnings before extraordinary items (EBEI), residual income (RI), economic value added (EVA) and cash value added (CVA).

The appendix consists of four sections. The first section provides an example of the standardised financial statements that are used in the study. A breakdown of the items included in these standardised statements, as well as a reconciliation of the standardised values and those values provided in the 2004 published annual financial statements for Pick&Pay are provided. Some of the adjustments included in the standardised financial statements are also highlighted. In the second section of the appendix, the calculations required to calculate the measures CFO, EBEI, RI, EVA and CVA, as well as their components, are defined. The calculation of the dependent variable, the firm's market adjusted return, is also described. The corresponding line items from the standardised statements are indicated in the calculation. The third section illustrates how the EVA, cost of capital and invested capital amounts are estimated for delisted firms. The final section of the appendix contains some additional notes to the calculations.

2.1 STANDARDISED FINANCIAL STATEMENTS

The McGregor BFA Database (2005) provides a set of published and standardised financial statements for both the listed, as well as delisted South African firms. For

the purpose of this study it was decided to use the standardised financial statements in order to facilitate the comparison between different firms.

The standardised financial statements obtained from the database consist of a balance sheet, an income statement, a cash flow statement, and a number of sundry data items. In order to illustrate the compilation of these standardised statements, the 2004 published annual financial statements for Pick&Pay are reconciled with the standardised statements. A break-down of the amounts, as well as references to their position in the published statements are provided. Those sundry data items that are required for the study are also included along with their BFA line codes. Finally, notes that provide additional information with regards to the calculation of certain items included in the standardised financial statements are also provided.

EXHIBIT 2.1: Reconciliation of the standardised financial statements with the published financial statements of Pick&Pay for 2004.

Item Description	2004	Amount in published financial statements	Reference in published financial statements
			Abbreviations:
PICKNPAY			B/S = Balance sheet
Number of Months Covered	12		I/S = Income statement
Year End Month	Feb		CFS = Cash flow statement
			N13 = Note 13 in the financial statements
BALANCE SHEET ('000s)	**R**		
1 Ordinary Share Capital[1]	5900	4714.03 x 1.25	B/S; N13
2 Non Distrib Reserves[2]	-184000	-199600+1600+13900+100	B/S; N13
3 Distributable Reserves[3]	1029900	1159700+(133900-99200)-99300+134800	B/S
4 Less: Cost Of Contr Subs	745100	745100	B/S
5 Intangible Assets	0	0	B/S
6 Ordinary Shareholders Interest	106700	5900-184000+1029900+745100	TOTAL

7 Minority Interest	0	0	B/S
8 Pref Share Capital	0	0	B/S
9 Total Owners' Interest	106700	106700+0+0	TOTAL
10 Land And Buildings	231800	231800	N8
11 Less: Total Depreciation	49500	49500	N8
12 Cost Other Fixed Assets	2802400	2802400	N8
13 Less: Total Depreciation	1757000	1757000	N8
14 Total Fixed Assets *A	1227700	1227700	TOTAL
15 Long-term Loans Advanced	217200	89600+127600	B/S; N9
16 Unlisted Investments	5200	5200	N9
17 Shares In Uncon Subs	0	0	B/S
18 Listed Investments	2500	2500	N9
19 Total Long-term Invest *B	224900	224900	TOTAL
20 Total Long-term Asset *A+B	1452600	1452600	TOTAL
21 Secured Long-term Borrow	177600	98900+78700	N15
22 Debentures	0	0	B/S
23 Other Long-term Borrowings[4]	171600	16000+36100+145000+(134400-159900)	B/S;N15;B/S;N15
24 Total Lt Loan Cap *C	349200	349200	TOTAL
25 Net Inv Lt Assets *A+B-C	1103400	1103400	TOTAL
26 Total Stock	1578700	1578700	B/S
27 Debtors	628100	628100	B/S
28 Short Term Loans Adv *Z	0	0	B/S
29 Cash And Bank	1502500	1502500	B/S
30 Other Current Assets	0	0	B/S
31 Total Current Assets *D	3709300	3709300	TOTAL
32 Short-term Borrowings	159900	159900	N15
33 Creditors	3972000	3972000	B/S
34 Bank Overdraft	0	0	B/S
35 Provision For Taxation	274800	274800	B/S
36 Provision For Dividends[5]	299300	299300	63.5*471403
37 Total Current Liab *E	4706000	4706000	TOTAL
38 Net Current Assets *D-E	-996700	-996700	TOTAL
39 Net Assets *A+B-C+D-E	106700	106700	TOTAL
40 Total Assets *A+B+D	5161900	5161900	TOTAL
41 Operating Assets *A+D-Z	4937000	4937000	TOTAL
42 Surplus Val Over Bv Inv			

INCOME STATEMENT ('000s)	R		
51 Turnover	29276100	29276100	I/S
52 Change In Turnover %	12		
53 Cost Of Sales	24420400	24420400	I/S
54 Trading Profit[6] *F	1632900	789000+843900	I/S; BFA71
55 Interest Received	81900	81900	I/S
56 Income Unlisted Investment	14200	14200	I/S
57 Income Listed Investment	0	0	I/S
58 Income Uncon Subsidiaries	0	0	I/S
59 Total Income Investment *G	96100	96100	TOTAL
60 Surplus Sale Investment	0	0	
61 Surplus Sale Non Tr Ass	0	0	
62 Extraordinary Profits[7]	15500	23900-8400	B/S; BFA332
63 Total Profits Extr Nat *H	15500	15500	TOTAL
64 Auditors Remun And Costs	6000	6000	N2
65 Depr Other Fixed Assets	280300	280300	N2
66 Depr Land And Buildings	2800	2800	N2
67 Rental Other Fixed Asset	534100	534100	N2
68 Directors Rem – Dir	1300	1300	N2
69 - Other	19400	19400	N2
70 Management And Oth Serv	0	0	N2
71 Total Cost Shown[8] *J	843900	843900	TOTAL
54 Trading Profit *F	1632900	1632900	TOTAL
59 Plus: Tot Inc Inv *G	96100	96100	TOTAL
63 Tot Pr Extr Nat *H	15500	15500	TOTAL
72 Total Income *F+G+H	1744500	1744500	TOTAL
71 Less: Total Cost Shown *J	843900	843900	TOTAL
73 Profit Bef Int And Tax	900600	900600	TOTAL
74 Less: Tot Interest Paid	46600	46600	I/S
75 Profit Before Taxation	854000	854000	TOTAL
76 Less: Taxation[9]	346600	305300+41300	N4
77 Profit After Taxation	507400	507400	TOTAL
78 Less: Min Int In Profit	0	0	I/S
79 Profit Ord And Pref Shr	507400	507400	TOTAL
80 Less: Ord Dividend[10]	377100	377100	80*471403
81 Pref Dividend	0	0	I/S
82 Retained Profits	130300	130300	TOTAL

CASH FLOW STATEMENT ('000s)	R		
701 Operating Profit/loss[11]	769200	789000-19800	CFS
702 Depr & Non Cash-items	283100	283100	CFS
703 Cash Ex Operations	1052300	1052300	TOTAL
704 Plus: Investment Income	14200	14200	CFS
705 Other Income	0	0	CFS
706 Decr/incr Work Cap	395500	395500	TOTAL
707 Decr/incr In Stock	-71400	-71400	CFS
708 Decr/incr Acc Receivable	-125100	-125100	CFS
709 Incr/decr Acc Payable	592000	592000	CFS
710 Incr/decr Int-free Loans	0	0	CFS
711 Csh Ex Operating Activity	1462000	1462000	TOTAL
712 Less: Net Int Paid/rec	-35300	-46600+81900	CFS
713 Taxation Paid	283500	283500	CFS
714 Cash Available	1213800	1213800	TOTAL
715 Less: Ord Dividend	316700	316700	CFS
716 Pref Dividend	0	0	CFS
717 Net Retained Cash	897100	897100	TOTAL
718 Less: Cash Invested	542100	542100	TOTAL
719 Fixed Assets Acquired	542100	107700+434400	CFS
720 Incr In Investments	0	0	CFS
721 Net Invst In Subs	0	0	CFS
722 Other Expenses/losses	0	0	CFS
723 Plus: Cash Ex Invest Acti	208800	208800	TOTAL
724 Proceeds Disp Fix Asset	33500	33500	CFS
725 Proceeds Disp Investment	175300	175300	CFS
726 Other Proceeds	0	0	CFS
727 Cash Generated	563800	563800	TOTAL
728 Incr/decr Long Term Liab	-80000	-87900+7900	CFS
729 Incr/decr Shrt Term Liab	-466900	-466900	CFS
730 Change In Share Capital	-16900	21100-38000	CFS
731 Other	0	0	CFS
732 Cash Utilised	-563800	-563800	TOTAL
SUNDRY DATA INFO	**R**		
102 Nr Ord Shares Issued	471403		
168 Extraord Item In Tax			
221 LT Loans - Int Bear	204200		
222 LT Loans - Int Free	145000		
223 ST Loans - Int Bear	159900		
224 ST Loans - Int Free	0		
309 Effect Tax Rate	35.7		

NOTES TO THE STANDARDISED FINANCIAL STATEMENTS (ALL FIGURES INDICATED IN R'000):

2.1.1 ORDINARY SHARE CAPITAL (BFA1)

The figure provided in the 2004 published financial statements amounts to R6 000. The BFA figure, however, is adjusted to exclude all treasury shares. Consequently, the total ordinary share capital is calculated as follows:

Number of shares held outside the group		4714.03 x R1,25 par value
	=	R5892.54
	≈	R5900

2.1.2 NON-DISTRIBUTABLE RESERVES (BFA2)

The non-distributable reserve figure consists of the treasury share figure (-199 600), the treasury shares excluded from the ordinary share capital (6000 – 5900 = 100), the revaluation reserve (1 600) and the share premium amount (13 900).

2.1.3 DISTRIBUTABLE RESERVES (BFA3)

The distributable reserve figure includes the retained profits (1 159 700), the net deferred tax amount (133 900-99 200), and the foreign currency translation reserve (134 800). It also contains the provision for dividends. Although this figure is not included in the published financial statements, BFA calculates the amount by considering the number of shares issued at year-end, and the dividend per share amount declared. For 2004, this amount is calculated as R299 300 (471 403 shares x 63.5c per share dividend declared). In order to make provision for the dividend

figure, this amount is subtracted from the distributable reserves, and included as part of the current liabilities (BFA36).

2.1.4 OTHER LONG-TERM BORROWINGS (BFA23)

This amount consists of the unissued shares (16 000), the promissory notes (36 100), the retirement scheme obligations (145 000), less the short-term portion of the long-term loans (134 400-159 900).

2.1.5 PROVISION FOR DIVIDENDS (BFA36)

The amount included under the distributable reserves (299 300) is included as part of the current liabilities.

2.1.6 TRADING PROFIT (BFA54)

This figure represents the profit before interest and investment income, profits or losses of an extraordinary nature, and other expenses shown separately in the income statement. It consists of the trading profit figure provided in the published financial statements (789 000), plus the total cost items shown separately in the income statement (843 900).

2.1.7 EXTRAORDINARY PROFITS (BFA62)

This figure includes all extraordinary profits and losses that are not disclosed in BFA60 and BFA61. All items classified as other extraordinary items by the firm's financial statements are included here (Profit/Loss Sundry Extraordinary of -8 400; BFA332). Also included are all profits / losses on foreign exchange movements. In the case of Pick&Pay, this figure is calculated by considering the change in the

foreign currency translation reserve in the balance sheet (134 800 – 110 900). For those companies that report these profits / losses in their income statements; the figure will still be included here.

2.1.8 TOTAL COST SHOWN (BFA71)

This figure consists of all the cost items which are shown separately in the published financial statements (Note 2). This figure is included when the trading profit figure (BFA54) is calculated.

2.1.9 TAXATION (BFA76)

This figure consists of the South African normal tax (305 300), as well as the secondary tax on companies (41 300). All deferred tax provisions are excluded from this figure.

2.1.10 ORDINARY DIVIDEND (BFA80)

This figure represents the total ordinary dividends declared during the financial year. In order to calculate the figure, the number of ordinary shares issued at the end of the financial year is multiplied with the total dividends per share declared during the financial year. For Pick&Pay, this amounts to R377 000 (471403 x 80c) during the 2004 financial year.

2.1.11 OPERATING PROFIT / LOSS (BFA701)

The operating profit figure included in the standardised cash flow statement consists of the trading profit reported in the published financial statements (789 000) minus the exchange rate effect on working capital (19 800).

2.2 CALCULATION OF THE VARIABLES

2.2.1 DEPENDENT VARIABLE

The market adjusted return (*MktAdjRet*) is calculated as the difference between the annual compounded return on a firm's shares, and that of the ALSI index. In order to calculate the annual compounded share return, the monthly returns on the share (consisting of the monthly capital gain / loss and all dividends received during the month) are calculated first. A 12-month period ending three months after the firm's financial year end is used to calculate the compounded annual return on the share. Similarly, the monthly returns on the ALSI index are calculated (including dividend payments), and compounded over the corresponding period. The reason for the three month delay is to allow information contained in the financial statements to be reflected in the share prices (Biddle *et al*., 1997: 312). Both the share and ALSI compounded returns are obtained from the McGregor BFA database (2005).

For Pick&Pay, the compounded annual return (calculated on a monthly basis) from May 2003 to May 2004 amounts to 42.41%. The compounded return for the ALSI over the same period amounts to 42.57%. Consequently, the firm's market adjusted return is calculated as:

$$\begin{aligned} MktAdjRet &= 42.41 - 42.57 \\ &= -0.16\% \end{aligned}$$

2.2.2 INDEPENDENT VARIABLES

The calculations of the various independent variables and their components that are investigated in the study are provided below. The corresponding values from the 2004 standardised financial statements of Pick&Pay are provided as an illustration of how these values are calculated.

The figure for cash flow from operations (CFO) is obtained from BFA714 (Cash available). This figure represents the cash flow figure provided in the published cash flow statement of the firm. It consists of the cash after tax and interest, and excludes cash flows of an extraordinary nature. The 2004 figure for Pick&Pay is determined as follows:

CFO	=	(BFA714) x (12 / #months)
	=	1 213 800 x (12/12)
	=	R1 213 800

The earnings before extraordinary items is calculated by taking the profit after tax, and excluding all the after-tax extraordinary items (BFA63), as well as their tax implications (BFA168).

EBEI	=	{BFA77-[(BFA63+BFA168) x (1-tax rate))]} x (12 / #months)
	=	{507 400-[(15 500+0) x (1-0.30)]} x (12/12)
	=	R496 550

For the purpose of this study, the amount of accruals included in the cash from operations figure is defined as the difference between the EBEI and the CFO.

ACCRUALS	=	EBEI – CFO
	=	496 550 – 1 213 800
	=	-R717 250

In order to calculate the net operating profit after tax figure (NOPAT), the after-tax interest expense (ATInt) needs to be added back to the EBEI figure.

ATInt	=	BFA74 x [1-tax rate] x (12 / #months)
	=	46 600 x [1 - 0.30] x (12/12)
	=	R32 620

NOPAT = EBEI + ATInt
= 496 550+ 32 620
= R529 170

The residual income is calculated by making provision for a capital charge (CapChg) on the invested capital amount. The capital charge is calculated by multiplying the invested capital amount at the beginning of the period (IC_{t-1}) with the firm's weighted average cost of capital after tax (c^*). For listed firms IC_{t-1}, c^* and EVA values are obtained from the McGregor BFA database. In the case of Pick&Pay the 2004 cost of capital amounted to 11.7%, while the IC_{t-1} was R1 514 549. Consequently, the residual income may be calculated as follows:

RI = NOPAT – {c^* x [IC_{t-1} x (12 / #months)]}
= 529 170 – {0.117 x [1 514 549 x (12/12)]}
= R351 968

The 2004 EVA value for Pick&Pay amounts to R386 210. Comparing the EVA value to the RI yields the accounting adjustments included in the NOPAT and capital values.

AcctAdj = EVA - RI
= 386 210 – 351 968
= R34 242

Since the EVA values published in the McGregor BFA database do not include all the accounting adjustments proposed by Stern Stewart, this figure does not correspond exactly to the values included in the study by Biddle *et al*. (1997). Through the standardisation process applied by the database, however, a number of the EVA adjustments are represented.

In the calculation of EBEI applied in this study, extraordinary items, as well as their tax implications, are excluded from the figure. This calculation differs somewhat from the approach applied by McGregor BFA to quantify EVA. Part of the difference

between EVA and RI could consequently be ascribed to this difference in the calculation.

The CVA value is calculated by considering the operating cash flow rather than operating profit and subtracting the gross capital charge. To convert NOPAT into the operating cash flow, the current year's depreciation amounts (BFA65 + BFA66) and amortisation are added to NOPAT to convert it into a cash flow figure. The trading profit figure included in the standardised income statement already includes the amortisation amount, and it is thus not necessary to add this amount to the NOPAT figure again. The capital charge is based on the gross value of the invested capital and the accumulated depreciation amounts (BFA11 + BFA13) are, therefore, added back to the invested capital.

CVA	=	Operating cash flow –gross capital charge
	=	(NOPAT + Depreciation and amortisation) – [c^* x (IC_{t-1}+ Accumulated Depreciation)]
	=	(NOPAT + BFA65 + BFA66) – [c^* x (IC_{t-1} + BFA11 + BFA13)]
	=	(529 170 + 280 300 + 2 800) – [11.7% x (1 514 549 + 49 500 + 1 757 000)]
	=	R457 950

The difference between the CVA value and the EVA value is calculated to quantify the CVA adjustments.

CVAAdj	=	CVA – EVA
	=	457 950 - 386 210
	=	R71 740

All the independent variables are deflated by the market value of the equity three months after the end of the previous financial year end (MVE_{t-1}). This period is chosen in order to correspond with the start of the dependent variable's calculation. Consequently, the 2004 value for Pick&Pay is calculated by considering the number

of shares outstanding at the end of the previous financial year (February 2003) and the market value of the shares three months later.

MVE_{t-1}	=	BFA102 (for 2003) x Share price (at the end of May 2003)
	=	483 444 x R13.50
	=	R6 526 494

2.3 ESTIMATION OF EVA, COST OF CAPITAL AND INVESTED CAPITAL VALUES FOR DELISTED FIRMS

The McGregor BFA database only provided EVA, c^* and IC_{t-1} figures for those firms listed at the end of the research period. In order to include those firms that delisted during the period investigated in this study, the values are estimated by applying a similar approach to the one employed in the database.

In order to calculate the cost of capital its various components are estimated and weighted according to the book values of the different forms of capital. The cost of equity is estimated as follows:

Cost of equity (COE)	=	$R_f + \beta$ (Equity market risk premium)

The risk-free return (R_f) is estimated by the return on a portfolio of long-term South African Government Bonds (SA Reserve Bank Quarterly Bulletin). Beta values (β) are obtained from the Financial Risk Service (Bradfield, 1991-2005). According to the Financial Risk Service (Bradfield, 2005) these beta values are calculated by including two refinements to the estimation process that improve the accuracy of the resulting values. The first of these is a Bayesian adjustment that considers previous information with regard to the beta values. A thin-trading correction adjustment is also implemented in an attempt to remove the bias resulting from thinly traded shares. Quarterly beta values are published, and the beta value from the quarter containing the

firm's financial year-end is used. Similarly to the calculations included in the database, the market risk premium is estimated at 6%.

A firm's cost of debt is then estimated as follows:

$$\text{Cost of debt (COD)} = \frac{\text{Interest paid}}{\text{Interest bearing loans}} \text{ x } (1 - \text{tax rate})$$

$$= \frac{\text{BFA74}}{\text{BFA221} + \text{BFA223}} \text{ x } [1 - \text{tax rate}]$$

The firm's total capital is calculated as by considering the following items:

$$\text{Capital} = \text{Long-term assets + goodwill + intangible assets + current assets – non-interest bearing current assets}$$

$$= \text{BFA20 + BFA4 + BFA5 + BFA31 – BFA33 – BFA35 – BFA36}$$

Based on these components, a firm's cost of capital can then be estimated as follows:

$$c^* = \left[\frac{\text{Ord share capital} + \text{distr. reserves} + \text{non - distr. reserves}}{\text{Capital}} \text{ x COE}\right] + \left[\frac{\text{Interest - bearing debt}}{\text{Capital}} \text{ x COD}\right]$$

$$= \left[\frac{\text{BFA1} + \text{BFA2} + \text{BFA3}}{\text{Capital}} \text{ x COE}\right] + \left[\frac{\text{BFA221} + \text{BFA223}}{\text{Capital}} \text{ x COD}\right]$$

Finally, in order to calculate the EVA values, NOPAT and the capital charge are calculated as follows:

$$\text{NOPAT} = \text{Profit after tax – Profits of an extraordinary nature + After-tax interest}$$

$$= \text{BFA77 – BFA63 + [BFA74 x (1-tax rate)]}$$

$$EVA = NOPAT - (IC_{t-1} \times c^{*})$$

2.4 NOTES TO THE CALCULATIONS:

1. In some cases, the published financial statements report a period that consists of more (or less) than twelve months. In order to convert the items to annual figures, the amounts are multiplied by the factor $\left(\frac{12}{\#\text{ of months covered}}\right)$.

2. In order to calculate after-tax figures, the firm's effective tax rate (BFA309) is used by BFA. These figures, however, are not available for all the years investigated in the study. In this study the maximum corporate tax rates applicable at the end of a firm's financial year were used. This is consistent with the approach applied by BBW (1997).

Appendix 3

CALCULATION OF THE INFLATION-ADJUSTED VERSIONS OF EVA AND CVA

The objective of this appendix is to illustrate the calculations required to calculate inflation-adjusted versions of EVA (EVA_{real}) and CVA (CVA_{real}). In order to calculate these measures, inflation adjustments are calculated according to guidelines contained in International Accounting Standard 15 (IAS15). These inflation adjustments consist of adjustments to the cost of sales, the depreciation, the level of gearing, and the property, plant and equipment (PPE).

This appendix consists of three sections. In the first section, the IAS15 inflation adjustments for Pick&Pay based on the 2004 financial statements are calculated. In the second section, these adjustments are used to calculate EVA_{real}. The final section contains the calculation of CVA_{real}.

3.1 IAS15 INFLATION ADJUSTMENTS

The main objective of IAS15 is to specify the effect that changing price levels have on the financial performance of a firm. According to the standard, firms need to reflect the effect of inflation by either restating their financial statements for changes in general price levels, or by indicating balance sheet items at replacement values. Profits also need to be adjusted based on the current cost approach.

According to IAS15, the minimum disclosure of certain adjustments is required. These adjustments include an adjustment to the cost of sales, depreciation, and the monetary items included in the balance sheet. Furthermore, the effect of inflation on inventory and property, plant and equipment need to be disclosed. In order to

investigate the effect of inflation on the measures EVA and CVA, the following inflation-adjustments are quantified:

3.1.1 COST OF SALES ADJUSTMENT

Inventory plays an important role in determining a firm's cost of sales since the opening and closing inventory values are included in its calculation. Inventory, however, is influenced by inflation and a firm needs to make provision for its higher replacement value when calculating the cost of sales. Failure to do so could result in a decrease in capital. In order to calculate the cost of sales adjustment the following formula is applied:

$$COSAdj_{2004} = Inv_{t\text{-}1} \times \left(\frac{Infl_{t\text{-}1}}{Infl_{t-\frac{1}{2}}} - 1 \right) + Inv_t \times \left(1 - \frac{Infl_{t-\frac{1}{2}}}{Infl_t} \right)$$

$$= BFA26_{2003} \times \left(\frac{PPI_{begin}}{PPI_{middle}} - 1 \right) + BFA26_{2004} \times \left(1 - \frac{PPI_{middle}}{PPI_{end}} \right)$$

$$= 1\,507\,300 \times \left(\frac{126.5}{126.5} - 1 \right) + 1\,578\,700 \times \left(1 - \frac{126.5}{125.2} \right)$$

$$= - R16\,392.25$$

This adjustment is subtracted from the operating profit since it indicates the increase in the cost of sales required to make provision for the higher replacement value of the items sold. During the 2004 financial year for Pick&Pay the value of the PPI decreased from 126.5 to 125.2. Consequently, a negative cost of sales adjustment is calculated. This negative value indicates an inflation gain generated on the inventory position of the firm.

3.1.2 DEPRECIATION ADJUSTMENT

In order to calculate EVA_{real} a depreciation adjustment based on the replacement value of the assets is required. This adjustment is calculated by first estimating the average age of the PPE and then adjusting the depreciation by the change in inflation since the estimated acquisition date of the PPE.

$$\text{Average age of PPE} = \frac{\text{Accumulated depreciation (BFA11} + \text{BFA13)}}{\text{Depreciation for the current year (BFA65} + \text{BFA66)}}$$

$$= \frac{49\,500 + 1\,757\,000}{280\,300 + 2\,800}$$

$$= 6.38 \text{ years}$$

Based on the average age the estimated acquisition date of the PPE is determined. For Pick&Pay this results in an acquisition date value of 84.2 (as measured at September 1997). By comparing this value with the PPI value of 125.2 (February 2004) the depreciation adjustment is calculated as follows:

$$\text{DeprAdj}_{2004} = \text{Depreciation (BFA11 + BFA13) x} \left(\frac{\text{PPI}_{\text{end}}}{\text{PPI}_{\text{acquisition}}} - 1 \right)$$

$$= (49\,500 + 1\,757\,000) \text{ x} \left(\frac{125.2}{84.2} - 1 \right)$$

$$= \text{R137 851.54}$$

This depreciation adjustment represents the additional depreciation that needs to be provided on the PPE and is subtracted from NOPAT.

3.1.3 INFLATION ADJUSTMENT TO PROPERTY, PLANT AND EQUIPMENT

When calculating the capital charge based on balance sheet values no provision is made for the higher replacement value of the PPE and as a result EVA and CVA may be overstated. This may be solved by estimating the current replacement value of the PPE and including it in the calculation of EVA_{real} and CVA_{real}. The adjustment is calculated by applying the same approach as for the depreciation adjustment.

$$PPEAdj_{2004} = \text{Carrying value of PPE (BFA14)} \times \left(\frac{PPI_{end}}{PPI_{acquisition}} - 1 \right)$$

$$= 1\,227\,700 \times \left(\frac{125.2}{84.2} - 1 \right)$$

$$= R597\,811.16$$

By including this figure with the book value of the PPE, an estimate of the replacement value of the PPE is obtained.

3.1.4 GEARING ADJUSTMENT

When calculating the inflation gearing adjustment a distinction needs to be made between a net monetary asset situation, where the firm financed the majority of its capital, and a net monetary liability situation, where debt providers carry the bulk of the inflation risk. In order to do this the value of the monetary and non-monetary assets, as well as the monetary and non-monetary liabilities, need to be calculated. The values of these items for Pick&Pay are determined as follows:

Monetary assets = Total long-term investment (BFA19) + Debtors (BFA27) + Short-term loans advanced (BFA28) + Cash and Bank (BFA29) + Other current assets (BFA30)

= 224 900 + 628 100 + 0 + 1 502 500 + 0

= R2 355 500

Non-monetary assets = Cost of subsidiaries (BFA4) + Intangible assets (BFA5) + Total fixed assets (BFA14) + Inventories (BFA26)

= 745 100 + 0 + 1 227 700 + 1 578 700

= R3 551 500

Monetary liabilities = Total long-term capital (BFA24) + Total current liabilities (BFA60)

= 349 200 + 4 706 000

= R5 055 200

Non-monetary liabilities = Ordinary share capital (BFA1) + Non-distributable reserves (BFA2) + Distributable reserves (BFA3) + Minority interest (BFA7) + Preference shares (BFA8)

= 5 900 – 184 000 + 1 029 900 + 0 + 0

= R851 800

In the case of Pick&Pay, the monetary liabilities exceed the monetary assets. A net monetary liability situation is, therefore, observed during 2004. The net monetary liabilities amount is calculated as follows:

Net monetary liabilities = Monetary liabilities – Monetary assets

= R5 055 200 - R2 355 500

= R2 699 700

The gearing adjustment is calculated as follows:

$$GearAdj_{liab;2004} = \left(\frac{\text{Average net monetary liabilities}}{\text{Average net monetary liabilities} + \text{Average non - monetary liabilities} + \text{Average PPE Adjustment}}\right) \text{x } (COSAdj_{2004} + DeprAdj_{2004})$$

$$= \left(\frac{2\,562\,350}{2\,562\,350 + 832\,150 + 551538}\right) \text{x } (-16\,392 + 137\,852)$$

= R78 869

Under a net monetary liability situation the operating profit is increased by the gearing adjustment amount to reflect the inflation risk absorbed by the debt capital providers.

3.1.5 COST OF CAPITAL

When calculating EVA_{real} the nominal cost of capital (c^*_{nom}) should be adjusted to reflect the effect of inflation. The inflation-adjusted cost of capital (c^*_{real}) is calculated as follows:

$$c^*_{real} = \left(\frac{1 + c^*_{nom}}{1 + Infl_{year}}\right) - 1$$

$$= \left(\frac{1+0.117}{1+\left(\frac{125.2}{126.5}-1\right)} \right) - 1$$

$$= 12.86\%$$

During the Pick&Pay's 2004 financial year, the PPI decreased from a level of 126.5 to 125.2. Consequently, the value of c^*_{real} exceeds the value of c^*_{nom}.

3.2 CALCULATION OF EVA_{real}

The 2004 value of EVA_{real} for Pick&Pay is calculated as follows:

$$EVA_{real;2004} = NOPAT_{real;2004} - (IC_{real;2003} \text{ x } c^*_{real;2004})$$

$$= (NOPAT_{nom;2004} - COSAdj_{2004} - DeprAdj_{2004} \pm GearAdj_{2004}) - [c^*_{real;2004} \text{ x } (IC_{nom;2003} + PPEAdj_{2004})]$$

$$= (563\ 412 + 16\ 392 - 137\ 852 + 78\ 869) - [12.86\% \text{ x } (1\ 514\ 549 + 597\ 811)]$$

$$= R249\ 176$$

The value of the inflation adjustments is determined by calculating the difference between the nominal and inflation-adjusted value of EVA:

$$InflAdj_{2004} = EVA_{real} - EVA_{nom}$$

$$= 249\ 176 - 386\ 210$$

$$= - R137\ 034$$

3.3 CALCULATION OF CVA_{real}

The 2004 value of CVA_{real} for Pick&Pay is calculated as follows:

$$CVA_{real;\ 2004} = (NOPAT_{nom;\ 2004} + CVAAdj_{op;\ 2004} - COSAdj_{2004} - DeprAdj_{2004} \pm GearAdj_{2004}) - [c^{*}_{real;\ 2004} \times (IC_{nom;\ 2003} + PPEAdj_{2004} + AccDepr_{2003})]$$

$$= (563\ 412 + 283\ 100 + 16\ 392 - 137\ 852 + 78\ 869) - [12.86\% \times (1\ 514\ 549 + 597\ 811 + 1\ 806\ 500)]$$

$$= R299\ 964$$

The value of the adjustments required to determine CVA_{real} are calculated as follows:

$$CVAAdj_{real;\ 2004} = CVA_{real} - EVA_{real}$$

$$= 299\ 964 - 249\ 176$$

$$= R50\ 788$$

Appendix 4

CALCULATION OF THE MEASURE CFROI

The objective of this appendix is to set out the calculations required to determine a firm's cash flow return on investment (CFROI). This appendix consists of two sections. In the first section, the four components required for the CFROI calculation are defined, and calculated by using information from the standardised financial statements of Pick&Pay for 2004. These statements are obtained from the McGregor BFA Database (2005). BFA line codes are indicated in the calculations. In the second section, these components are used to determine the firm's CFROI.

4.1 ASSET LIFE

The asset life is defined as the estimated average life of a firm's tangible assets. In order to estimate this value, the adjusted gross plant figure is compared to the annual depreciation charge (Madden, 1991: 113).

$$\text{Asset life} = \frac{\text{Adjusted gross plant (BFA12)}}{\text{Depreciation of gross plant (BFA65)}}$$

$$= \frac{2\,802\,400}{280\,300}$$

$$= 10 \text{ years}$$

The standardised statements obtained from the McGregor BFA Database (2005) distinguish between Land and Buildings (BFA 10), and Other Fixed Assets (BFA 12). Although buildings are depreciable, no depreciation is provided on land. Since it is not possible to distinguish between these two items, it was decided to classify them as

non-depreciating assets within the CFROI calculation. This is consistent with the classification applied by Madden (1999: 113).

4.2 INFLATION-ADJUSTED DEPRECIATING ASSETS

The inflation-adjusted depreciating asset value represents the inflation-adjusted value of all depreciating assets employed in a firm to generate cash flow. It consists of the inflation-adjusted gross plant, construction in progress (CIP), inflation-adjusted leased property, and intangible assets and goodwill (Madden, 1999: 123). The calculations of these values are set out in the following sections.

4.2.1 INFLATION-ADJUSTED GROSS PLANT

The historic cost of the depreciating assets (as reported in a financial statement) does not represent the current replacement value of those items. Since CFROI values are calculated by comparing the investment in a firm to the inflation-adjusted cash flows generated, it is important that the depreciating asset value is converted to represent the current purchasing power of money (Madden, 1999: 115). The approach suggested by Madden (1999: 253) to achieve this requires inputs that are not available from the BFA database. Consequently, an approach similar to that employed under International Accounting Standard 15 (IAS 15) is applied in this study.

According to IAS 15, the average age of the assets is estimated by comparing the accumulated depreciation figure to the depreciation for the current year.

$$\text{Estimated average age of assets} = \frac{\text{Accumulated depreciation (BFA13)}}{\text{Depreciation for the current year (BFA65)}}$$

$$= \frac{1\,757\,000}{280\,300}$$

$$= 6.3 \text{ years}$$

In order to adjust the historical cost of the asset to an inflation-adjusted value, the Production Price Index (PPI) value at the estimated date of acquisition is compared to the PPI value at the end of the current financial year. For Pick&Pay, the following adjustment is made:

PPI value on 29 February 2004: 125.2
PPI value on 31 October 1997: 84.4

$$\text{Inflation-adjusted gross plant} = \text{Gross plant (BFA12)} \times \left(\frac{\text{PPI at year end}}{\text{PPI at acquisition date}} \right)$$

$$= 2\,802\,400 \times \left(\frac{125.2}{84.4} \right)$$

$$= \text{R } 4\,157\,114.69$$

4.2.2 CONSTRUCTION IN PROGRESS

Since CIP is depreciable when it is completed, it also needs to be included with the other depreciating assets. In the BFA statements, however, no values for CIP are available, and it is therefore excluded in this study.

4.2.3 INFLATION-ADJUSTED GROSS LEASED PROPERTY

According to International Accounting Standard 17 (IAS 17) a distinction is made between finance and operating leases. Finance leases are capitalised, and the underlying asset is included in the balance sheet with the other assets of the lessee. Operating leases are not capitalised, but are treated as expenses in the income statement over the period of the lease.

When calculating a firm's CFROI, the assets employed are compared to the cash flow generated. The method of financing of the assets is not taken into consideration. All assets obtained by means of a lease (finance as well as operating) should, therefore, be included in the calculation. The standardised statements used in this study already include the capitalised finance leases. Operating leases, however, are not included.

In order to include those assets obtained by means of an operating lease, the future rental payments are discounted at a real debt rate to determine the value of the inflation-adjusted gross leased property (Madden, 1999: 119). The lease life is estimated by the asset life (as calculated above), while the nominal cost of debt is adjusted by inflation expectations to determine the real debt rate. Madden (1999: 243) presents an approach to determine the nominal debt rate. However, because of the unavailability of corporate bond ratings for all listed firms included in this study, an alternative approach was followed. The risk-free rate, measured as the return on a portfolio of long-term government bonds, was used as an estimate of the nominal debt rate. For Pick&Pay the 2004 value amounts to 9.40%.

To calculate the real debt rate, inflation expectations are estimated by means of a 10 year moving-average of changes in an inflation index (Madden, 1999: 243). Applying South African PPI values yields a value of 6.34% for 2004. Consequently, the real debt rate can be estimated as follows:

$$\text{Real debt rate} = \left(\frac{1+\text{nominal rate}}{1+\text{inflation rate}}\right)-1$$

$$= \left(\frac{1.0940}{1.0634}\right)-1$$

$$= 2.88\%$$

The inflation-adjusted gross leased property amount is determined as the present value of the lease payment of R534 100 (BFA67) over the asset life (10 years) at a real discount rate of 2.88%. This yields an inflation-adjusted capitalised value of R4 582 983.

4.2.4 INTANGIBLES AND GOODWILL

When calculating CFROI, intangible assets and goodwill need to be included (Madden, 1999: 123). For Pick&Pay, this value amounts to:

Intangibles / Goodwill	=	BFA4 + BFA5
	=	745 100 + 0
	=	R745 100

4.3 INFLATION-ADJUSTED NON-DEPRECIATING ASSETS

This value represents the inflation-adjusted non-depreciating assets invested in the firm, and consists of the net monetary assets, inflation-adjusted inventory value, inflation-adjusted land and buildings, as well as investments and allowances. At the end of the asset life, this amount represents a cash inflow.

4.3.1 MONETARY ASSETS

The monetary assets consist of cash, short-term loans granted, trade receivables, and other current assets. In the case of Pick&Pay the monetary assets are as follows:

Monetary assets	=	Short-term loans (BFA28) + Trade receivables (BFA27) + Other current assets (BFA30) + Cash (BFA29)
	=	0 + 628 100 + 0 + 1 502500
	=	R 2 130 600

4.3.2 NET MONETARY ASSETS

The net monetary asset figure is calculated as the difference between the monetary assets, and the adjusted current liability amount (Madden, 1999: 129). The adjusted current liabilities exclude the current portion of long-term debt, as well as any short-term debt, since all debt holders are included under capital providers in CFROI calculations (Madden, 1999: 129).

Adjusted current liabilities	=	Trade payables (BFA33) + Provision for tax (BFA35) + Provision for dividends (BFA36)
	=	3 972 000 + 274 800 + 299 300
	=	R 4 546 100

Consequently the net monetary assets amount to:

Net monetary assets	=	Monetary assets – Adjusted current liabilities
	=	2 130 600 – 4 546 100
	=	- R 2 415 500

4.3.3 INFLATION-ADJUSTED INVENTORY

If inventory is valued according to the first-in-first-out (FIFO) method, the closing balance in the balance sheet should represent the most current replacement value. Some firms, however, apply the last-in-first-out (LIFO) approach. Inventory valued according to this approach is not shown at its current replacement value, and an inflation adjustment is required. This is usually achieved by adding the LIFO reserve to the inventory values. The standardised financial statements used in this study

contain a classification of the inventory valuation approach used, as well as the LIFO reserve (in those cases where LIFO is applied).

In the case of Pick&Pay, the FIFO method is applied, and no inflation adjustment to the closing inventory balance is required.

Inflation-adjusted inventory = Inventory (BFA26)
= R1 578 700

4.3.4 INFLATION-ADJUSTED LAND

Since the balance sheet values of land and buildings represent the historical costs of these items, it is necessary to adjust these values in order to arrive at their inflation-adjusted levels. A similar approach to the one applied to gross plant is followed.

$$\text{Inflation-adjusted land} = \text{Land and Buildings (BFA10)} \times \left(\frac{\text{PPI at year end}}{\text{PPI at acquisition date}} \right)$$

$$= 231\,800 \times \left(\frac{125.2}{84.4} \right)$$

$$= R\,343\,854.98$$

4.3.5 INVESTMENTS AND ALLOWANCES

This figure represents all investments, as well as long-term loans granted. For Pick&Pay, the amounts included are:

Investment and allowances	=	Long-term loans advanced (BFA15) + Unlisted investments (BFA16) + Investment in unconsolidated subsidiaries (BFA17) + Listed investments (BFA18)
	=	217 200 + 5 200 + 0 + 2 500
	=	R 224 900

4.4 INFLATION-ADJUSTED GROSS CASH FLOW

The inflation-adjusted gross cash flow represents the cash generated by a firm's operations. The method of financing is not important when determining this value. The components of the inflation-adjusted gross cash flow are discussed in the following sections.

4.4.1 DEPRECIATION AND AMORTISATION

The depreciation and amortisation subtracted in the income statement are not cash items, and are consequently added back when the cash flow is determined.

Depreciation and amortisation	=	Depreciation other fixed assets (BFA65) + Depreciation land and buildings (BFA66)
	=	280 300 + 2 800
	=	R 283 100

4.4.2 ADJUSTED INTEREST EXPENSE

The interest paid represents a financing cost. As a result, it needs to be excluded from the cash flow figure. Madden (1999: 133) calculates the adjusted interest expense after removing the capitalised interest expense and the financial subsidiary interest expense. The interest expense obtained from the standardised financial statements used in this study already excludes the capitalised interest expense. Unfortunately, information with regard to financial subsidiaries is not available.

Adjusted interest expense	=	Total interest paid (BFA74)
	=	R 46 600

4.4.3 RENTAL EXPENSE

According to CFROI calculations, operating lease payments are capitalised and included with the other depreciation assets. The rental expense is, therefore, included in the calculation of the cash flow figure.

Rental expense	=	Rental other fixed assets (BFA67)
	=	R 534 100

4.4.4 MONETARY HOLDING GAIN / (LOSS)

In those cases where a positive net monetary asset situation exists, the cash flow needs to be reduced to make provision for the lower purchasing power of money. For a negative net monetary asset situation, the opposite occurs. The negative net monetary asset figure represents an obligation which will be repaid with money with a lower purchasing power. Hence the cash flow needs to be increased.

The adjustment is calculated as follows (Madden, 1999: 135):

Monetary holding gain / (loss) = Net monetary assets x $\left(\frac{\text{PPI at year end}}{\text{PPI at beginning of year}} - 1\right)$

= - 2 415 500 x $\left(\frac{125.2}{126.5} - 1\right)$

= R 24 823.32

In this example, the negative net monetary asset situation is offset by a decrease in the inflation. In general, a negative adjustment value needs to be added to the cash flow, while a positive value is subtracted.

4.4.5 INVENTORY CHARGE TO FIFO INVENTORIES

If the FIFO inventory valuation approach is applied, the resulting cost of sales figure does not represent the inflation-adjusted cost of the inventory sold. In order to address this problem, the cash flow needs to be adjusted with an additional inventory charge. This charge is calculated by adjusting the inventory figure by the change in the PPI during the year (Madden, 1999: 133).

Inventory charge = Total stock (BFA26) x $\left(\frac{\text{PPI at year end}}{\text{PPI at beginning of year}} - 1\right)$

= 1 578 700x $\left(\frac{125.2}{126.5} - 1\right)$

= - R 16 223.79

Since the PPI decreased during 2004, the resulting figure represents a profit on Pick&Pay's inventory position. In general, a negative adjustment value increases the cash flow, while a positive value reduces it.

4.4.6 MINORITY INTEREST

The minority interest holders are classified as capital providers in the CFROI valuation model (Madden, 1999: 137). When determining the inflation-adjusted gross cash flow, it is important to ensure that the minority interest is added back. For Pick&Pay, this figure amounts to R0 during 2004 (BFA78).

4.4.7 SPECIAL ITEM AFTER TAX

The profits / losses resulting from activities that are not part of a firm's normal operating activities should not be included in the CFROI calculation. An example of this includes the profit or loss on the sale of assets or investments. The after-tax values of these items need to be added back when calculating the cash flow (Madden, 1999: 138). In this study, the marginal tax rate for the financial year is used in the following calculation:

Special item after tax	=	[Profit on sale of investment (BFA60) + Profit on sale of non- trading assets (BFA61) + Extraordinary profits (BFA62)] x (1 – tax rate)
	=	(0 + 0 + 15 500) x (1 – 0.30)
	=	R 10 850

4.5 CALCULATION OF CFROI

Exhibit 4.1 contains the components required for the calculation of CFROI.

Exhibit 4.1: CFROI components

ASSET LIFETIME		**10 YEARS**
INFLATION-ADJUSTED DEPRECIATING ASSETS		**R 9 485 197.81**
Inflation-adjusted gross plant	4 157 114.69	
Construction in progress	0.00	
Inflation-adjusted gross leased property	4 582 983.12	
Intangibles and goodwill	745 100.00	
INFLATION-ADJUSTED NON-DEPRECIATING ASSETS		**- R 268 045.02**
Net monetary assets	-2 415 500.00	
Inflation-adjusted inventory	1 578 700.00	
Inflation-adjusted land	343 854.98	
Investments and allowances	224 900.00	
INFLATION-ADJUSTED GROSS CASH FLOW		**R 1 373 450.47**
Profit after tax and minority interest	507 400.00	
+ Depreciation and amortisation	283 100.00	
+ Adjusted interest expense	46 600.00	
+ Rental expense	534 100.00	
± Monetary holding gain / loss	- 24 823.32	
± Inventory charge to FIFO inventories	16 223.79	
+ Minority interest	0.00	
+ Special item after tax	10 850.00	

The values provided in Exhibit 4.1 can be represented by the following cash flow diagram:

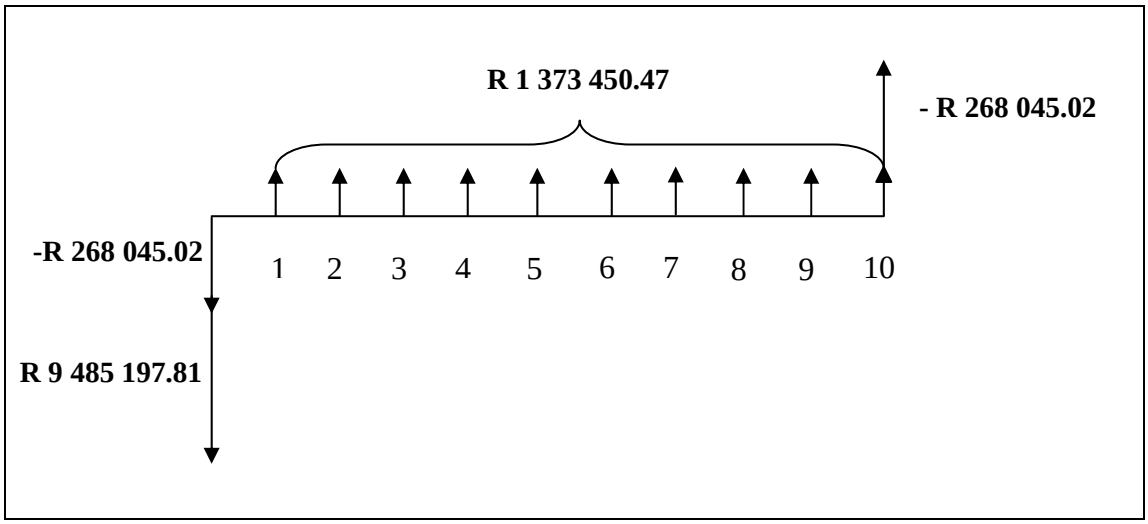


Exhibit 4.2: Cash flow diagram of the CFROI components

Based on the values provided in Exhibit 4.1 and Exhibit 4.2, a CFROI value of 7.7% is calculated for Pick&Pay during 2004.

Appendix 5

THE LISTED AND DELISTED INDUSTRIAL FIRMS INCLUDED IN THE FINAL SAMPLE

INDUSTRIAL – LISTED FIRMS
ADCORP HOLDINGS LTD
ADONIS KNITWEAR HOLDINGS LTD
ADVTECH LTD
AECI LTD
AFGRI LTD
AFRICAN & OVERSEAS ENTERPRISES LTD
AFRICAN MEDIA ENTERTAINMENT LTD
AFRICAN OXYGEN LTD
AG INDUSTRIES LTD
ALEX WHITE HOLDINGS LTD
ALLIED ELECTRONICS CORPORATION LTD
ALLIED TECHNOLOGIES LTD
AMALGAMATED APPLIANCE HOLDINGS LTD
AMLAC LTD
ANBEECO INVESTMENTS HOLDINGS LTD
ARGENT INDUSTRIAL LTD
ASPEN PHARMACARE HOLDINGS LTD
ASTRAL FOODS LTD
ASTRAPAK LTD
AVENG LTD
AVI LTD
AWETHU BREWERIES LTD
BARLOWORLD LTD
BASIL READ HOLDINGS LTD
BEARING MAN LTD
BELL EQUIPMENT LTD
BICC CAFCA LTD
BIDVEST GROUP LTD (THE)
BOWLER METCALF LTD
BRANDCORP HOLDINGS LTD
BRIDGESTONE FIRESTONE MAXIPREST LTD
BUILDMAX LTD
BYTES TECHNOLOGY GROUP LTD
CARGO CARRIERS LTD
CASHBUILD LTD
CAXTON CTP PUBLISHERS AND PRINTERS
CERAMIC INDUSTRIES LTD
CITY LODGE HOTELS LTD
COMAIR LTD
COMBINED MOTOR HOLDINGS LTD

INDUSTRIAL – LISTED FIRMS
COMMAND HOLDINGS LTD
COMPU-CLEARING OUTSOURCING LTD
CONAFEX HOLDINGS SOCIETE ANONYME
CONCOR LTD
CONNECTION GROUP HOLDINGS LTD
CONTROL INSTRUMENTS GROUP LTD
CROOKES BROTHERS LTD
CULLINAN HOLDINGS LTD
DATACENTRIX HOLDINGS LTD
DATATEC LTD
DELTA ELECTRICAL INDUSTRIES LTD
DIGICORE HOLDINGS LTD
DIMENSION DATA HOLDINGS PLC
DISTELL GROUP LTD
DISTRIBUTION & WAREHOUSING NETWORK LTD
DON GROUP LTD
DORBYL LTD
EDGARS CONSOLIDATED STORES LTD
ELB GROUP LTD
ELEXIR TECHNOLOGY HOLDINGS LTD
ELLERINE HOLDINGS LTD
ENTERPRISE OUTSOURCING HOLDINGS LTD
ENVIROSERV HOLDINGS LTD
ERP.COM HOLDINGS LTD
EXCELLERATE HOLDINGS LTD
FAMOUS BRANDS LTD
FARITEC HOLDINGS LTD
FOSCHINI LTD
FRONTRANGE LTD
GIJIMA AST GROUP LTD
GLOBAL VILLAGE HOLDINGS LTD
GOLD REEF CASINO RESORTS LTD
GRINDROD LTD
GROUP FIVE LTD
HERITAGE COLLECTION HOLDINGS LTD
HIGHVELD STEEL & VANADIUM CORPORATION LTD
HOUSE OF BUSBY LTD (THE)
HOWDEN AFRICA HOLDINGS LTD
HUDACO INDUSTRIES LTD
IDION TECHNOLOGY HOLDINGS LTD
ILIAD AFRICA LTD
ILLOVO SUGAR LTD
IMPERIAL HOLDINGS LTD
INTERTRADING LTD
INVICTA HOLDINGS LTD
ITALTILE LTD
JASCO ELECTRONICS HOLDINGS LTD

INDUSTRIAL – LISTED FIRMS
JD GROUP LTD
JOHNNIC COMMUNICATIONS LTD
JOHNNIC HOLDINGS LTD
KAGISO MEDIA LTD
KAIROS INDUSTRIAL HOLDINGS LTD
KAP INTERNATIONAL HOLDINGS LIMITED
KING CONSOLIDATED HOLDINGS LTD
LA GROUP LTD
MASONITE (AFRICA) LTD
MASSMART HOLDINGS LTD
MATHOMO GROUP LTD
MEDI-CLINIC CORPORATION LTD
METAIR INVESTMENTS LTD
MILLIONAIR CHARTER LTD
MITTAL STEEL SOUTH AFRICA LIMITED
MOBILE INDUSTRIES LTD
MONEY WEB HOLDINGS LTD
MONTEAGLE SOCIETE ANONYME
MORIBO LEISURE LTD
MR PRICE GROUP LTD
MTN GROUP LTD
MURRAY AND ROBERTS HOLDINGS LTD
MUSTEK LTD
NAMIBIAN SEA PRODUCTS LTD
NAMPAK LTD
NASPERS LTD N
NETWORK HEALTHCARE HOLDINGS LTD
NEW AFRICA INVESTMENTS LTD
NEW CLICKS HOLDINGS LTD
NICTUS LTD
NORTHERN ENGINEERING INDUSTRIES (AFRICA) LTD
NU-WORLD HOLDINGS LTD
OCEANA GROUP LTD
OMNIA HOLDINGS LTD
PALS HOLDINGS LTD
PARACON HOLDINGS LTD
PASDEC RESOURCES SA LTD
PHUMELELA GAMING AND LEISURE LTD
PICK N PAY STORES LTD
PINNACLE TECHNOLOGY HOLDINGS LTD
PRETORIA PORTLAND CEMENT COMPANY LTD
PRIMEDIA LTD
PRIMESERV GROUP LTD
PRISM HOLDINGS LTD
QUYN HOLDINGS LTD
RAINBOW CHICKEN LTD
RETAIL APPAREL GROUP LTD

INDUSTRIAL – LISTED FIRMS
REUNERT LTD
REX TRUEFORM CLOTHING COMPANY LTD
RICHEMONT SECURITIES AG
SABMILLER PLC
SAPPI LTD
SASANI LTD
SEARDEL INVESTMENT CORPORATION LTD
SEKUNJALO INVESTMENTS LTD
SETPOINT TECHNOLOGY HOLDINGS LTD
SHOPRITE HOLDINGS LTD
SOVEREIGN FOOD INVESTMENTS LTD
SPANJAARD LTD
SPESCOM LTD
SPUR CORPORATION LTD
SQUARE ONE SOLUTIONS GROUP LTD
STEINHOFF INTERNATIONAL HOLDINGS LTD
SUN INTERNATIONAL LTD
SUPER GROUP LTD
TELKOM SA LIMITED
TEREXKO LTD
TIGER BRANDS LTD
TIGER WHEELS LTD
TONGAAT-HULETT GROUP LTD
TOURISM INVESTMENT CORPORATION LTD
TRADEHOLD LTD
TRANSPACO LTD
TRENCOR LTD
TRUWORTHS INTERNATIONAL LTD
UCS GROUP LTD
UNITRANS LTD
VALUE GROUP LTD
VENTER LEISURE & COMMERCIAL TRAILERS LTD
VESTA TECHNOLOGY HOLDINGS LTD
W B HOLDINGS LTD
WESCO INVESTMENTS LTD
WINHOLD LTD
WOOLWORTHS HOLDINGS LTD
YORK TIMBER ORGANISATION LTD

INDUSTRIAL – DELISTED FIRMS
ABACUS TECHNOLOGY HOLDINGS LTD
ADCOCK INGRAM LTD
ADVANCED TECHNICAL SYSTEMS LTD
ADVSOURCE HOLDINGS LTD
ALLIANCE PHARMACEUTICALS LTD
AMALGAMATED BEVERAGE INDUSTRIES LTD
ARIES INVESTMENT HOLDINGS LTD
AUTOPAGE HOLDINGS LTD
AUTOQUIP GROUP LTD
AVIS SOUTHERN AFRICA LTD
BATEMAN INDUSTRIAL CORP LTD
BATEMAN PROJECT HOLDINGS LTD
BEV & CONSUMER IND HOLDINGS LTD
BOLTON FOOTWEAR LTD
BOLTON INDUSTRIAL HOLDINGS LTD
BOUMAT LTD
BRANSBY INVESTMENT COMPANY LTD
BRITISH AMERICAN TOBACCO SA
C G SMITH FOODS LTD
C G SMITH LTD
CADBURY SCHWEPPES (SOUTH AFRICA) LTD
CEMENTATION COMPANY (AFRICA) LTD
CHEMICAL SERVICES LTD
CLINIC HOLDINGS LTD
CLYDE INDUSTRIAL CORPORATION LTD
COASTAL GROUP LTD
COATES BROTHERS (SOUTH AFRICA) LTD
CONSHU HOLDINGS LTD
DAEWOO ELECTRONICS SA LTD
DALYS LTD
DEL MONTE ROYAL CORPORATION LTD
DEL MONTE ROYAL FOODS LTD
DEL MONTE ROYAL HOLDINGS LTD
DUNLOP AFRICA LTD
ELECTRONIC MEDIA NETWORK & SUPERSPORT INTL HLD LTD
FASIC LTD
FELTEX LTD
FINTECH LTD
FORTUNE BEVERAGES LTD
FRALEX LTD
FRANSAF LTD
FRASER ALEXANDER LTD
FURNCO INVESTMENTS LTD
GENERAL OPTICAL COMPANY LTD
GLOBAL CAPITAL PVT EQUITY LTD
GLODINA HOLDINGS LTD

INDUSTRIAL – DELISTED FIRMS
GLOHOLD LTD
GROUP FIVE HOLDINGS LTD
GUBB AND INGGS LTD
HARWILL INVESTMENTS LTD
HICOR LTD
HOMECHOICE HOLDINGS LTD
HUNT LEUCHARS & HEPBURN HOLDINGS LTD
I-FUSION HOLDINGS LTD
INTERVID LTD
IRVIN AND JOHNSON LTD
IST GROUP LTD
KAROS HOTELS LTD
KUNENE TECHNOLOGY LTD
LANGEBERG HOLDINGS LIMITED
LASER GROUP LTD (THE)
LENCO HOLDINGS LTD
LIBLIFE STRATEGIC INVESTMENTS LTD
LITHOTECH LTD
LOGOPT LTD
MACADAMS BAKERY SUPPLIES HOLDINGS LTD
MACMED HEALTH CARE LTD
MALBAK LTD
MAS HOLDINGS LTD
MASTERFRIDGE LTD
MAXTEC LTD
MAXTEL LTD
MCCARTHY LTD
METJE & ZIEGLER LTD
METKOR GROUP LTD
METRO CASH & CARRY LTD
MIDAS LTD
MIH HOLDINGS LTD
MONEX LTD
NAMIBIAN FISHING INDUSTRIES LTD
NANDOS GROUP HOLDINGS LTD
NATIONAL CHICK LTD
NEI AFRICA HOLDINGS LTD
NET 1 APPLIED TECHNOLOGY HOLDINGS LTD
NINIAN & LESTER HOLDINGS LTD
OMEGA HOLDINGS LTD
OSI HOLDINGS LTD
OZZ LTD
PACIFIC ASIA INV INTERNATIONAL
PARAGON BUSINESS COMMUNICATIONS LTD
PENROSE HOLDINGS LTD
PEPKOR LTD
PLANIT TECHNOLOGY HOLDINGS LTD

INDUSTRIAL – DELISTED FIRMS
PLATE GLASS & SHATTERPRUFE IND
POLIFIN LIMITED
PORTLAND HOLDINGS LTD
POWER TECHNOLOGIES LTD
PROFURN LTD
REAL AFRICA INVESTMENTS LTD
REBSERVE HOLDINGS LTD
REMBRANDT BEHERENDE BELEG BPK
RETAIL CORPORATION LTD
ROMATEX LTD
SAFMARINE & RENNIES HOLDINGS LTD
SCHARRIGHUISEN HOLDINGS LTD
SEA HARVEST CORPORATION LTD
SEARTEC LTD
SELECTIVE FINANCIAL GROUP LTD
SERVEST HOLDINGS LTD
SM GOLDSTEIN LTD
SOFTLINE LTD
SONDOR INDUSTRIES LTD
SOUTH AFRICAN DRUGGISTS LTD
SPICER HOLDINGS LTD
SPUR HOLDINGS LIMITED
SPUR STEAK RANCHES LTD
STANTRONIC GROUP HOLDINGS LTD
STELLENBOSCH FARMERS WINERY GROUP LTD
STOCKS & STOCKS HOLDINGS LTD
STOCKS & STOCKS LTD
STRAND GROUP HOLDINGS LTD
SUN INTERNATIONAL (SOUTH AFRICA) LTD
SWEETS FROM HEAVEN HOLDINGS LTD
TEGNIESE & IND BELEGGINGS BPK
TEGNIESE BELEGGINGSKORP BPK
TELJOY HOLDINGS LTD
THW INVESTMENTS LTD
TOCO HOLDINGS LTD
TOLARAM 2000 LTD
TOYOTA SOUTH AFRICA LTD
UNIHOLD LTD
VENTRON CORPORATION LTD
VOLTEX HOLDINGS LTD
WACO INTERNATIONAL LTD
WETHERLYS INVESTMENT HOLDINGS LTD
WINBEL LTD

Chapter 5

THE INFORMATION CONTENT OF ECONOMIC VALUE ADDED (EVA)

5.1 INTRODUCTION

While proponents of the measure economic value added (EVA) generally report high levels of correlation between the measure and shareholder value creation, other researchers have at times reported conflicting results. It is, therefore, not clear whether the measure is able to outperform more conventional accounting measures when attempting to account for the variation in share returns.

In this chapter the ability of the measure EVA to explain market adjusted share returns is investigated for a sample of firms listed in the Industrial Sector of the Johannesburg Securities Exchange (JSE) and compared to that of traditional and other value based financial performance measures.

The remainder of this chapter consists of seven sections. In the first section of the chapter EVA is decomposed into its contributing components. The second section considers the data used to calculate the different measures that are evaluated. The third section contains the descriptive statistics of the measures investigated. In the fourth section of the chapter the relative information content of EVA relative to residual income (RI), earnings before extraordinary items (EBEI) and operating cash flow (CFO) is evaluated. The fifth section investigates the incremental information content of EVA components, and whether the inclusion of these components contributes significantly to the information content of the other measures. The sixth section of the chapter contains a number of sensitivity analyses. The final section presents the summary and conclusions.

5.2 THE COMPONENTS OF EVA

This chapter investigates the relative and incremental information content of EVA and the measures operating cash flow (CFO), earnings before extraordinary items (EBEI) and residual income (RI). To do so, EVA is partitioned into its contributing components using the approach applied by Biddle *et al*. (1997: 305). According to this approach, EVA may be presented as follows (Biddle *et al*., 1997: 307):

$$EVA = CFO + Accrual + ATInt - CapChg + AcctAdj \quad (5.1)$$

where:

Accrual	=	The total operating accruals of the firm
ATInt	=	Interest expense after provision for tax
CapChg	=	The capital charge based on the cost of capital and the invested capital at the beginning of the financial year
AcctAdj	=	The accounting adjustments included in the calculation of EVA

The components of the nominal financial performance measures investigated in this study are provided in Figure 4.1 in Chapter 4. This chapter focuses on the measure EVA, and the relationships between the EVA components investigated are summarised in Figure 5.1 (Biddle *et al*., 1997: 307):

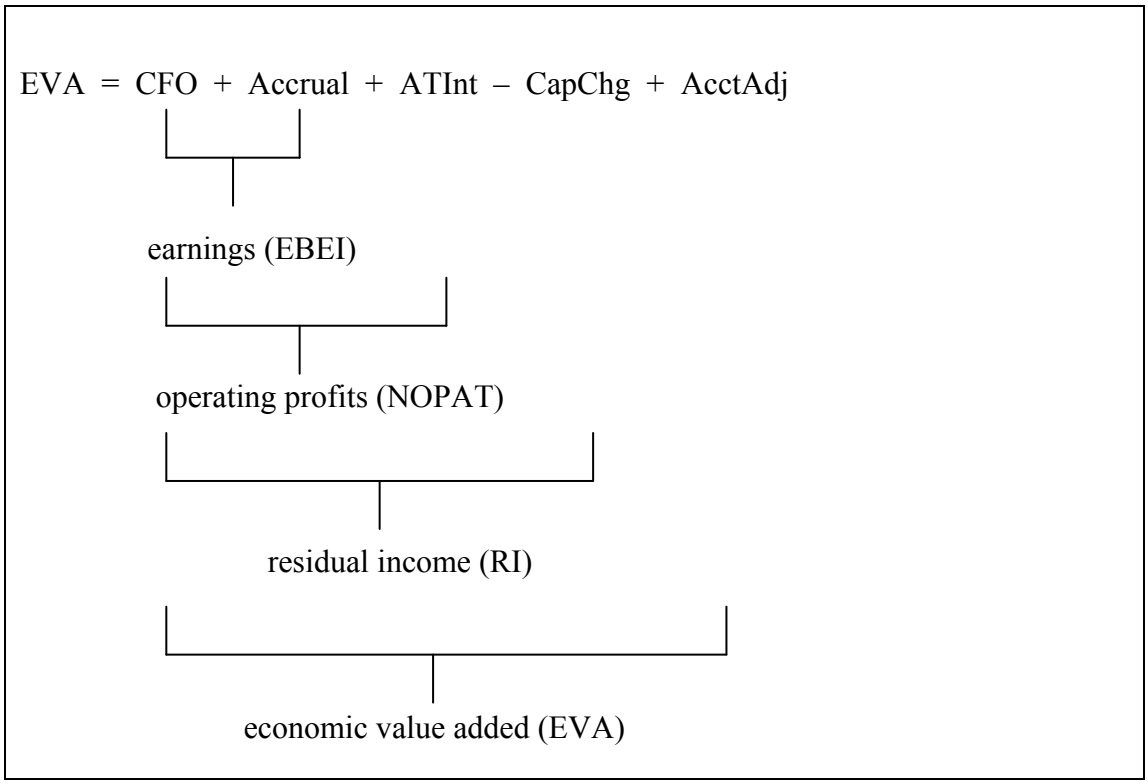


Figure 5.1: Components of economic value added (EVA)

5.3 DATA

The measures CFO, EBEI, RI and EVA, as well as their contributing components, are calculated for all firms listed in the industrial sector of the JSE during the 15-year period from 1991 to 2005. The calculation of these measures is discussed in greater detail in Appendix 2.

To reduce heteroscedasticity in the data, all the independent variables are divided by the market value of equity as measured three months after the beginning of the firm's financial year (MVE_{t-1}) (BBW, 1997: 313). This period is chosen to correspond with the period over which the dependent variable is calculated. By dividing the values of the measures by the market value of the equity, the independent variables are adjusted for the size of the firms.

Following Biddle *et al*. (1997: 311), those observations in excess of eight standard deviations from the median are classified as extreme outliers, and consequently 48 observations were removed from the sample. Both the dependent and independent variables are also winsorised to ± four standard deviations from the median. The final sample investigated in this chapter consisted of 328 firms providing 2 991 complete observations.

5.4 DESCRIPTIVE STATISTICS

5.4.1 MEASURES INCLUDED IN THE RELATIVE INFORMATION CONTENT TESTS

The descriptive statistics of the winsorised values of *MktAdjRet*, EBEI, CFO, RI and EVA included in the relative information content tests pooled across time are provided in Table 5.1.

Table 5.1: Descriptive statistics on the dependent and independent variables in the relative information content tests

	Descriptive statistics				
	Dependent Variable	**Independent Variables**			
	MktAdjRet	**EBEI**	**EVA**	**RI**	**CFO**
Mean	0.122	0.187	-0.161	-0.101	0.282
Median	0.011	0.119	-0.021	0.001	0.144
Std. Dev.	0.758	0.538	0.605	0.518	0.651
	Correlations				
	Dependent Variable	**Independent Variables**			
	MktAdjRet	**EBEI**	**EVA**	**RI**	**CFO**
MktAdjRet	1.000				
EBEI	0.293***	1.000			
EVA	0.117***	0.324***	1.000		
RI	0.157***	0.440***	0.858***	1.000	
CFO	0.176***	0.474***	0.008	0.029	1.000

Notes:

All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are size-adjusted by dividing them by the market value of the equity as measured three months after the beginning of the financial year.

*** Significant at the 1% level

The measure CFO exhibits the largest mean and median values, followed by EBEI, RI and EVA respectively. The measures CFO and EBEI exhibit positive mean and median values. In the case of the two value based measures EVA and RI, the median values calculated for the pooled data are close to zero. To investigate the behaviour of the four measures over the 15-year period investigated, the median values of the size-adjusted measures are plotted in Figure 5.2.

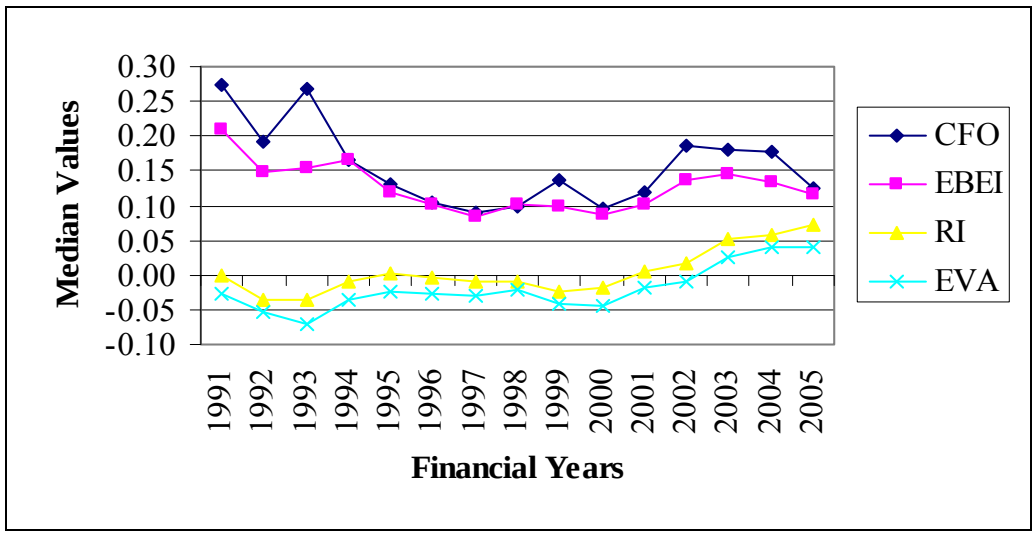


Figure 5.2: Median values of the size-adjusted measures CFO, EBEI, RI and EVA from 1991 to 2005

The size-adjusted median CFO and EBEI values exhibit a decreasing trend over the 15-year period investigated. The median EVA values from 1991 to 2002 are all negative and close to zero, while the last three years exhibit increasing positive values. The majority of the median RI values are also negative and close to zero during the period 1991 tot 2002 (nine negative values versus three positive values), and are also followed by increasing positive values over the last three years of the study. In a competitive economy, most firms struggle to generate returns in excess of their costs of capital (Biddle *et al.*, 1997: 313). The period 1991 to 2002 exhibits this pattern.

In order to investigate the increases in the EVA values over the last three years of the study, the median EVA, NOPAT, invested capital, and cost of capital values are plotted in Figure 5.3:

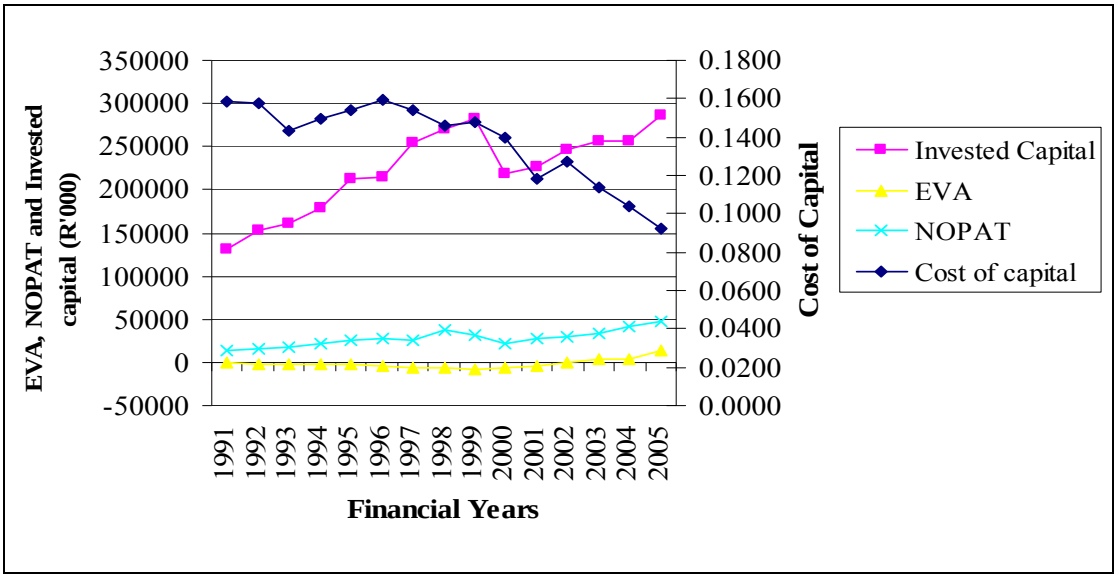


Figure 5.3: Median values of EVA, NOPAT, invested capital, and cost of capital from 1991 to 2005

From Figure 5.3 it can be seen that both the median NOPAT and invested capital amounts increase during the period under review. The median cost of capital, however, decreases from 12.70% to 9.20% over the last three years of the study. It is possible that the increases in the median values of EVA over the last three years could be attributed to this sharp decrease in the cost of capital required by investors in South African industrial firms.

In accordance with the patterns reported by Biddle *et al*. (1997: 313), statistically significant positive correlations are found between most of the measures. The correlations between CFO, and EVA and RI, however, are not statistically significant. In terms of the correlations between the dependent and the independent variables, the highest correlation is observed between *MktAdjRet* and EBEI. This is followed by CFO, RI and EVA respectively.

5.4.2 COMPONENTS INCLUDED IN THE INCREMENTAL INFORMATION CONTENT TESTS

The descriptive data of the winsorised EVA components included in the incremental information content tests pooled across time are provided in Table 5.2.

Table 5.2: Descriptive statistics on the dependent and independent variables in the incremental information content tests

	Descriptive statistics					
	Dependent Variable	**Independent Variables**				
	MktAdjRet	**CFO**	**Accruals**	**ATInt**	**CapChg**	**AccAdj**
Mean	0.122	0.282	-0.069	0.082	0.372	-0.061
Median	0.011	0.144	-0.020	0.026	0.166	-0.016
Std. Dev.	0.758	0.651	0.597	0.170	0.645	0.303
	Correlations					
	Dependent Variable	**Independent Variables**				
	MktAdjRet	**CFO**	**Accruals**	**ATInt**	**CapChg**	**AccAdj**
MktAdjRet	1.000					
CFO	0.176***	1.000				
Accruals	0.058***	-0.492***	1.000			
ATInt	0.080***	0.237***	-0.085***	1.000		
CapChg	0.137***	0.444***	-0.033	0.616***	1.000	
AccAdj	-0.028	-0.027	-0.022	-0.198***	-0.152***	1.000

Notes:

All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are deflated by the market value of the equity as measured three months after the beginning of the financial year.

*** Significant at the 1% level

The mean and median values of both Accruals and AccAdj are negative. This is consistent with the smoothing effect of these components on a firm's CFO (BBW, 1997: 316). The significant negative correlation between CFO and Accruals could be attributed to the same reason. The correlation between CFO and AccAdj is also negative, but not statistically significant. Statistically significant positive correlations are found between CFO, ATInt and CapChg. According to Biddle *et al*. (1997: 316), firms with higher CFO also have higher debt and equity costs. When the dependent variable is considered, the highest correlation is observed between *MktAdjRet* and CFO.

5.5 RELATIVE INFORMATION CONTENT TESTS

The relative information content of the four measures EBEI, CFO, RI and EVA is evaluated by comparing the adjusted R^2s values obtained from four separate regressions based on the following equation:

$$D_t = b_0 + b_1 X_t / \text{MVE}_{t\text{-}1} + b_2 X_{t\text{-}1} / \text{MVE}_{t\text{-}1} + e_t. \quad (5.2)$$

where:

D_t	=	the market-adjusted return for period *t*.
X	=	one of the four measures CFO, EBEI, RI, EVA.
$\text{MVE}_{t\text{-}1}$	=	the market value of the equity three months after the beginning of the financial year.

The results from the relative information content tests are provided in Table 5.3.

Table 5.3: Tests of the relative information content of EVA, residual income, earnings and operating cash flow

Relative information content								
Rank order of R^2	**Observations**	**(1)**		**(2)**		**(3)**		**(4)**
Panel A:	**Coefficient of positive and negative values of each performance measure constrained to be equal [a]**							
All firms	**2543**	**EBEI**	>	**RI**	>	**CFO**	>	**EVA**
Adj. R^2		0.0758		0.0348		0.0257		0.0253
Panel B:	**Coefficient of positive and negative values of each performance measure allowed to differ [b]**							
All firms	**2543**	**RI**	>	**EBEI**	>	**EVA**	>	**CFO**
Adj. R^2		0.0910		0.0851		0.06718		0.0372

Notes:

[a] In Panel A, the regression based on Equation (5.2) is conducted, where: $D_t = b_0 + b_1 X_t / \text{MVE}_{t-1} + b_2 X_{t-1} / \text{MVE}_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the four measures CFO, EBEI, RI and EVA, and MVE is the market value of the equity three months after the beginning of the financial year.

[b] In Panel B, the regression used in Panel A is adjusted to allow different coefficients for positive and negative values of the independent variable. The regression based on Equation (5.3) is conducted, where: $D_t = c_0 + c_1 X_{t;\text{pos}} / \text{MVE}_{t-1} + c_2 X_{t;\text{neg}} / \text{MVE}_{t-1} + c_3 X_{t-1;\text{pos}} / \text{MVE}_{t-1} + c_4 X_{t-1;\text{neg}} / \text{MVE}_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the four measures CFO, EBEI, RI and EVA, and MVE is the market value of the equity three months after the beginning of the financial year.

Panel A of Table 5.3 contains the adjusted R^2 values of the four separate regressions. The measures are arranged in decreasing sequence based on their adjusted R^2 values. EBEI has a significantly higher adjusted R^2 value (0.0758) than the other measures. It is followed by RI (0.0348), CFO (0.0257) and EVA (0.0253) correspondingly. In terms of relative information content, EBEI, therefore, appears to outperform the other three measures.

According to Hayn (1995: 127), Burgstahler and Dichev (1997: 192) and Collins, Pincus and Xie (1997) profitable firms exhibit larger earnings responses than loss-making firms. O'Byrne (1997: 51) also recommends that a distinction is made between positive and negative EVA values. The tests for relative information content are repeated after allowing different coefficients for positive and negative values:

$$D_t = c_0 + c_1 X_{t;\text{pos}} / \text{MVE}_{t-1} + c_2 X_{t;\text{neg}} / \text{MVE}_{t-1} + c_3 X_{t-1;\text{pos}} / \text{MVE}_{t-1} + c_4 X_{t-1;\text{neg}} / \text{MVE}_{t-1} + e_t \quad (5.3)$$

The results from these regressions are provided in Panel B of Table 5.3. All the measures exhibit higher adjusted R^2 values. RI experienced the largest increase in its adjusted R^2 value (0.0348 to 0.0910), and exhibits the highest adjusted R^2 value compared to the other measures. It is followed by EBEI (0.0851), EVA (0.0672) and CFO (0.0372) respectively.

5.6 INCREMENTAL INFORMATION CONTENT TESTS OF EVA COMPONENTS

The incremental information contents of the EVA components are evaluated by conducting the following regression:

$$\begin{aligned} MktAdjRet_t = {} & d_0 + d_1 \text{CFO}_t / \text{MVE}_{t-1} + d_2 \text{CFO}_{t-1} / \text{MVE}_{t-1} + \\ & d_3 \text{Accrual}_t / \text{MVE}_{t-1} + d_4 \text{Accrual}_{t-1} / \text{MVE}_{t-1} + \\ & d_5 \text{ATInt}_t / \text{MVE}_{t-1} + d_6 \text{ATInt}_{t-1} / \text{MVE}_{t-1} + \\ & d_7 \text{CapChg}_t / \text{MVE}_{t-1} + d_8 \text{CapChg}_{t-1} / \text{MVE}_{t-1} + \\ & d_9 \text{AcctAdj}_t / \text{MVE}_{t-1} + d_{10} \text{AcctAdj}_{t-1} / \text{MVE}_{t-1} + e_t \end{aligned} \quad (5.4)$$

The results of the incremental information content tests are provided in Table 5.4.

Table 5.4: Tests of incremental information content of EVA components: CFO, operating accruals, after-tax interest, capital charge, accounting adjustments

	Obs.	Constant	CFO_t	CFO_{t-1}	$Accrual_t$	$Accrual_{t-1}$	$ATInt_t$	$ATInt_{t-1}$	$CapChg_t$	$CapChg_{t-1}$	$AccAdj_t$	$AccAdj_{t-1}$
Adj. R^2	**0.0597**											
Predicted signs:			+	-	+	-	-	+	-	+	+	-
Regression coefficient[a]	2662	0.0461	0.29049	-0.03021	0.25265	-0.07615	-0.21327	0.57654	-0.00226	-0.01581	0.00161	-0.06236
***t*-stat**		2.69	9.41***	-0.94	8.48***	-2.39**	-1.38	3.64***	-0.05	-0.33	0.03	-1.24
***F*-stat**			48.08		36.01		8.28		0.16		0.78	
***p*-value** [b]			(<0.0001)		(<0.0001)		(-0.0003)		(-0.8542)		(-0.4567)	

Notes:

[a] The regression based on Equation (5.4) is conducted: $MktAdjRet_t = d_0 + d_1\ CFO_t / MVE_{t-1} + d_2\ CFO_{t-1} / MVE_{t-1} + d_3\ Accrual_t / MVE_{t-1} + d_4\ Accrual_{t-1} / MVE_{t-1} + d_5\ ATInt_t / MVE_{t-1} + d_6\ ATInt_{t-1} / MVE_{t-1} + d_7\ CapChg_t / MVE_{t-1} + d_8\ CapChg_{t-1} / MVE_{t-1} + d_9\ AcctAdj_t / MVE_{t-1} + d_{10}\ AcctAdj_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, while the independent variables are the EVA components (CFO, accruals, after-tax finance cost, capital charge and accounting adjustments). MVE is the market value of equity three months after the start of the financial year.

[b] *p*-values in parentheses represent non-directional *F*-test of the null hypothesis of no incremental information content (Hypothesis H_{INC})

*** Significant at the 1% level
** Significant at the 5% level

An adjusted R^2 value of 0.0597 is obtained for the regression based on Equation 5.4. Perusal of Table 5.4 indicates that the regression coefficients of the current year's CFO (CFO_t), both the current and previous years' accrual values ($Accrual_t$ and $Accrual_{t-1}$), and the after-tax interest expense for the previous year ($ATInt_{t-1}$), are all statistically significant at the 0.05 level or better. The coefficients of the other components, however, are not statistically significant. This indicates that the current year's EBEI (consisting of CFO_t and $Accrual_t$), combined with the change in accruals (as represented by $Accrual_{t-1}$), contain the majority of information when attempting to explain the market adjusted share returns of a firm.

If the *F*-statistics are considered, it would be seen that CFO, combined with Accruals, provide the largest incremental information contributions. The *F*-statistic for the measure ATInt is also statistically significant at the 0.01 level. CapChg and AccAdj, however, are not statistically significant, and exhibit much lower *F*-statistics (0.16 and 0.78 respectively).

5.7 SENSITIVITY ANALYSES

In order to investigate the sensitivity of the results, the relative and incremental information content tests are repeated for different specifications of the independent and dependent variables. In the first sensitivity analysis, the sample is divided into different sub-periods instead of the pooled 15-year period. The tests are conducted on the data obtained for each individual year included in the study. The second sensitivity analysis considers the market adjusted return when calculated over a five-year period of time, and investigates the information content of the change in the value, as well as the sum, of the independent variables over these five-year periods. Finally, the market adjusted share returns are calculated for a two-year period consisting of the current and subsequent year. The aim of this analysis is to determine whether a longer period of time between the publication of a firm's financial statements and the reflection of the information in its share performance is required.

5.7.1 DIVIDING THE SAMPLE INTO SUB-PERIODS

The information content tests are repeated for each individual year from 1992 to 2005. The results from the relative information content tests indicate that EBEI has the largest adjusted R^2 values for seven of the fourteen years, followed by RI for five years and CFO for the remaining two years. Based on the results it appears that EVA does not outperform the other measures in terms of the relative information content.

5.7.2 FIVE-YEAR RETURNS AS DEPENDENT VARIABLE

Stewart (1991: 66) and Stewart (1994: 75) report the strongest results supporting EVA over a five-year period. To investigate the effect of a five-year return period, the relative information contents of the measures are evaluated by means of the following regression (Biddle *et al*., 1997: 326):

$$MktAdjRet_{5years} = g_0 + g_1 \sum X_t / \text{MVE}_{t-5} + g_2 \sum X_{t-5} / \text{MVE}_{t-5} + e_t \quad (5.5)$$

where $MktAdjRet_{5years}$ is the market adjusted return calculated over the most recent five-year period, $\sum X_t$ is the sum of performance measure X over the most recent five-year period, and $\sum X_{t-5}$ is the sum of performance measure X over the prior five-year period.

The results of the relative information content tests indicate that EBEI once again has the highest adjusted R^2 value (0.277), followed by the measures RI (0.233), CFO (0.223) and EVA (0.157) respectively.

O'Byrne (1996: 117) and O'Byrne (1997: 50) report that changes in EVA have greater explanatory power than changes in earnings when attempting to explain the variation in share returns. To investigate this finding, the tests are also repeated for changes in the measures over the five-year period.

$$MktAdjRet_{5years} = h_0 + h_1 \Delta X_t / \text{MVE}_{t-5} + h_2 \Delta X_{t-5} / \text{MVE}_{t-5} + e_t \quad (5.6)$$

where $MktAdjRet_{5years}$ is the market adjusted return calculated over the most recent five-year period, ΔX_t is the change of performance measure X over the most recent five-year period, and ΔX_{t-5} is the change of performance measure X over the prior five-year period.

Similar results are obtained as before, with EBEI having the highest adjusted R^2 value (0.273), followed by CFO (0.237), RI (0.218) and EVA (0.206) respectively.

5.7.3 TWO-YEAR RETURNS

To make provision for the possibility that the market takes time to absorb information and that the firm's current EVA values may only be reflected in its future share returns, the return interval was extended to a two-year period. The market adjusted share return was compounded over the current and the subsequent year, and compared to the measures investigated in the study.

The results from these relative information content tests indicate that EBEI once again has the highest adjusted R^2 value (0.0726) for two-year returns, followed by the measures RI, CFO and EVA (adjusted R^2 values between 0.0213 and 0.0364).

5.8 SUMMARY

In this chapter, the information content of the measure EVA was compared to that of the measures RI, EBEI and CFO to determine whether EVA is able to outperform the other measures in explaining share returns. An approach similar to Biddle *et al.* (1997: 320) was applied to a sample of South African industrial firms to evaluate the relative information content of the individual measures, as well as the incremental information content of the EVA components.

The results of the relative information content tests indicated that EVA does not outperform earnings (EBEI) in explaining the variation in the market-adjusted return of a firm's shares. In the majority of the tests EVA also does not manage to outperform RI, a less complex value based measure. On this basis, the relatively complex accounting adjustments required to calculate EVA do not add significant information.

The incremental information content tests show that EVA components do not add significant additional information content beyond that contained in earnings (EBEI). More specifically, it appears that the capital charge and accounting adjustments required to calculate EVA did not add statistically significant incremental information content at all. Based on the results reported in this chapter, claims that EVA outperforms other financial performance measures could not be supported.

The results largely correspond to those obtained by Biddle *et al*. (1997) for US firms. Claims that EVA outperforms the other measures are rejected in both studies. The major differences are observed for the results of the incremental information content tests, where only cash from operations, accruals and the after-tax interest payments contributed significant incremental information in the South African context. In the study conducted by Biddle *et al*. (1997), the incremental information contents of all EVA components are significant (although the inclusions of these components are not considered to provide significant economic benefits beyond that provided by EBEI). In general it would appear that the conclusions of the Biddle *et al*. (1997) study also apply in the smaller, less liquid South African economy where information may be less freely available.

One of the problems identified with the measure EVA in Chapter 3 is the possible distorting effects that inflation may have on it. In the next chapter of this study the inflation adjustments recommended by International Accounting Standard 15 (IAS15) are quantified and included in the calculation of an inflation-adjusted EVA value. The relationship between this inflation-adjusted EVA value and a firm's share returns is then investigated in order to evaluate its information content.

Chapter 6

THE INFORMATION CONTENT OF INFLATION-ADJUSTED EVA

6.1 INTRODUCTION

Economic value added (EVA) is proposed as a major improvement over the traditional financial performance measures and its proponents report high levels of correlation between the measure and share returns (Stewart, 1991:66; Stewart, 1994: 75; Walbert, 1994: 110; Grant, 1996: 44; Bacidore *et al*., 1997: 17; Lehn & Makhija, 1996: 36; O'Byrne, 1996: 117; O'Byrne, 1997: 54; Worthington & West, 2004: 201). In the previous chapter of this study, the information contents of EVA and its contributing components were evaluated. The results, however, indicate that the measure is not able to outperform accounting earnings (EBEI) in explaining market-adjusted share returns.

A number of studies have identified inflation as one of the shortcomings of EVA (Black *et al*., 2001: 76; Fabozzi & Grant, 2000: 164; De Villiers, 1997: 285; Erasmus & Lambrechts, 2006: 14; Warr, 2005: 120). Since inflation influences the firm's assets (such as property, plant and equipment (PPE) and inventories) as well as its capital (the amount of debt capital, as well as the cost of capital) the level of inflation impacts on EVA. A number of inflation adjustments have been proposed to address this concern.

In this chapter EVA is calculated after provision is made for inflation adjustments to the firm's cost of sales, depreciation, the effect of financial gearing, PPE and cost of capital by applying International Accounting Standard 15 (IAS15). The main objective is to evaluate whether the resulting inflation-adjusted EVA measure (EVA_{real}) contains additional information content beyond that contained in the

nominal version of EVA (EVA_{nom}) evaluated in the previous chapter. Furthermore, the relationships between the two versions of EVA and market-adjusted share returns are investigated.

The remainder of this chapter is in seven sections. The first section focuses on the calculation of the EVA_{nom} and EVA_{real} values investigated in this chapter. The second section considers differences between the nominal and real values of the measure EVA during a period characterised by changing levels of inflation, and highlights those areas where inflation influences the measure. The third section defines the contributing components of EVA_{nom} and EVA_{real}. The fourth section contains the descriptive statistics of the measures and components evaluated in the relative and incremental information content tests. The fifth section contains the results from the relative information content tests, while the sixth section reports on the results from the incremental information contents tests. The final section of the chapter presents the summary and conclusions.

6.2 THE CALCULATION OF EVA_{nom} AND EVA_{real}

The calculation of EVA_{nom} is described in more detail in Chapter 4 and Appendix 2. In order to calculate the inflation-adjusted version of EVA (EVA_{real}), inflation adjustments are calculated according to the guidelines contained in IAS15. These adjustments consist of adjustments to the cost of sales, the depreciation, the level of gearing, and the PPE. The firm's cost of capital is also adjusted to reflect its real cost. The calculations of these adjustments are also discussed in Chapter 4, and a complete example of the calculations is provided in Appendix 3.

In order to calculate the nominal version of EVA, the following formula is applied:

$$EVA_{nom;\,t} = NOPAT_{nom;\,t} - (IC_{nom;\,t\text{-}1} \times c^{*}_{nom;\,t}) \qquad (6.1)$$

where:

$EVA_{nom;\ t}$	=	The nominal value of a firm's EVA calculated for time period *t*
$NOPAT_{nom;\ t}$	=	The firm's nominal NOPAT
$IC_{nom;\ t\text{-}1}$	=	The nominal invested capital at the beginning of the period
$c^{*}_{nom;\ t}$	=	The nominal cost of capital

After the inclusion of the IAS15 inflation adjustments, the inflation-adjusted version of the measure EVA can be calculated as follows:

$$EVA_{real;t} = NOPAT_{real;t} - (IC_{real;t\text{-}1} \times c^{*}_{real;t}) \quad (6.2)$$

$$= (NOPAT_{nom;t} - COSAdj_t - DeprAdj_t \pm GearAdj_t) - [(IC_{nom;t\text{-}1} + PPEAdj_t) \times c^{*}_{real;\ t}] \quad (6.3)$$

where:

$EVA_{real;t}$	=	EVA in real terms, calculated after the inflation adjustments to NOPAT and invested capital are included
$NOPAT_{real;t}$	=	NOPAT after including the cost of sales (COSAdj), depreciation (DeprAdj) and gearing adjustments (GearAdj)
$IC_{real;t\text{-}1}$	=	the invested capital after including the PPE inflation adjustment
$c^{*}_{real;t}$	=	the inflation-adjusted cost of capital

During the period 1991 to 2005 South African inflation values exhibited highly variable levels. Sharp decreases from 1991 to 1998 were followed by substantial increases for the period 1999 to 2002, which in turn were trailed by relatively low levels of inflation from 2003 onwards. As an illustration, the average annual levels of the Production Price Index (PPI) for the period 1991 to 2005 are provided in Figure 6.1:

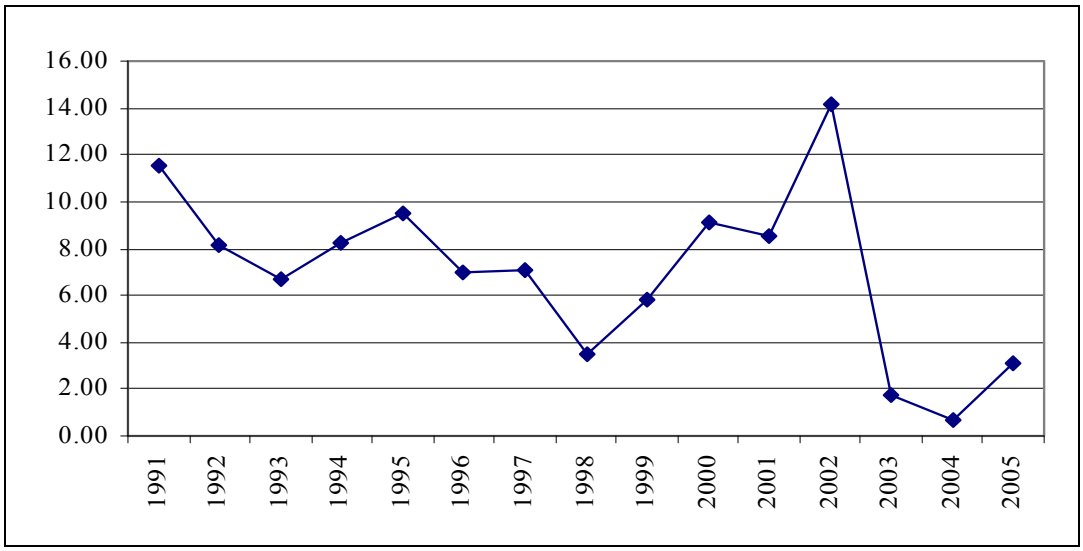


Figure 6.1: Average annual PPI values for the period 1991 to 2005

By evaluating the values of EVA_{nom} and EVA_{real} against this background it becomes possible to determine whether increasing and decreasing levels of inflation have the same effect on EVA. All firms listed in the Industrial Sector of the Johannesburg Securities Exchange (JSE) during this 15 year period are included in the sample. A total of 358 firms, providing a total of 3 070 complete observations, are included. In order to produce a more homogenous sample, firms listed in the Mining and Financial sectors are excluded from the sample.

In this study the inflation adjustments as recommended by IAS15 are calculated and included in the calculation of EVA_{real}. For the purpose of the inflation adjustments, production price index (PPI) values were obtained from the Bureau for Economic Research (BER) (2005). PPI values are used for the inflation adjustments rather than the changes in the general Gross Domestic Product (GDP) deflator applied by Warr (2005: 126) since the PPI values reflect changes in the price of the items utilised in the production processes of the industrial firms investigated in this study.

The measures CFO, EBEI, RI and the nominal and real versions of EVA (EVA_{nom} and EVA_{real}), as well as their contributing components, are calculated. The calculations of these measures are discussed in greater detail in Appendix 2 and Appendix 3.

6.3 DIFFERENCES BETWEEN NOMINAL AND INFLATION-ADJUSTED EVA

In order to investigate the effect of inflation on EVA, the nominal and inflation-adjusted values of the measure are calculated and compared during a period which contains decrease, increasing and low levels of inflation.

6.3.1 DESCRIPTIVE STATISTICS

The descriptive statistics of EVA_{nom}, EVA_{real} and the components included in their calculations are provided in Table 6.1.

Table 6.1: Descriptive statistics of the measures EVA_{nom}, EVA_{real} and their components for the full period 1991 to 2005

Variable	Valid N	Mean	Median	Std.Dev.
$NOPAT_{nom}$	3070	202591	25208	1407857
$NOPAT_{real}$	3070	137701	12517	1359378
COSAdj	3070	19216	2947	49124
DeprAdj	3070	46180	4888	185091
GearAdj	3070	505	293	83112
IC_{nom}	3070	1432786	217026	3966782
IC_{real}	3070	1905969	271185	5683931
c^*_{nom}	3070	13.86	13.90	5.64
c^*_{real}	3070	6.41	6.62	5.99
EVA_{nom}	3070	8348	-2215	1238557
EVA_{real}	3070	8921	-952	1299812
Inflation	3070	7.10	7.59	3.75

Notes:

$NOPAT_{nom}$ is the net operating profit after tax in nominal terms. $NOPAT_{real}$ is the net operating profit adjusted for inflation by including the cost of sales, depreciation and gearing adjustments. The cost of sales, depreciation, and gearing adjustments are calculated according to accounting guideline IAS15. The cost of sales and depreciation adjustments are subtracted from the NOPAT to make provision for the higher replacement value of inventory and PPE respectively. The gearing adjustment is added to NOPAT in a net monetary liability situation, and subtracted in a net monetary asset situation. IC_{nom} is the invested capital in nominal terms as used in the calculation of EVA_{nom}. IC_{real} is the invested capital in real terms, calculated by adding the PPE adjustment to the nominal invested capital. c^*_{nom} and c^*_{real} are the weighted average cost of capital in nominal and real terms used to calculate EVA_{nom} and EVA_{real} respectively. Inflation is the annual inflation, calculated as the change in the PPI during a firm's financial year.

The average rate of inflation during the period under investigation is 7.1%. The inflation adjustments to NOPAT result in an average $NOPAT_{real}$ value that is lower than the average $NOPAT_{nom}$. The average IC_{real}, however, is higher than the average IC_{nom}, while the average c^*_{nom} is substantially higher than the average c^*_{real}. The average EVA_{real}, however, is only 6.86% higher than EVA_{nom}, indicating that the lower $NOPAT_{real}$ and higher IC_{real} values are offset by the lower c^*_{real}. On average, the inflation distortions result in EVA_{nom} values that are lower than EVA_{real}.

In order to investigate the effect of the changing inflation levels on the values of the measures, descriptive statistics for the three inflation sub-periods 1991 tot 1998, 1999 to 2002, and 2003 to 2005 were also calculated. The average and median values of the variables for the three inflation sub-periods are provided in Table 6.2.

Table 6.2: Average and median values for the measures EVA_{nom}, EVA_{real} and their components for the three inflation sub-periods

Variable	1991-1998		1999-2002		2003-2005	
	MEAN	**MEDIAN**	**MEAN**	**MEDIAN**	**MEAN**	**MEDIAN**
$NOPAT_{nom}$	127245	21385	248774	26623	330732	39759
$NOPAT_{real}$	66669	10030	176521	12442	266527	29586
COSAdj	18241	3572	27330	4278	8093	294
DeprAdj	38345	5101	44051	3787	71289	5708
GearAdj	-3990	360	-872	216	15176	281
IC_{nom}	1075207	185877	1622670	244442	2090721	264872
IC_{real}	1526313	245828	2043169	298703	2714042	311427
c^*_{nom}	15.24	15.30	13.55	13.40	10.56	10.45
c^*_{real}	7.18	7.32	3.92	3.80	8.53	8.49
EVA_{nom}	-29619	-3100	23637	-4610	86492	4850
EVA_{real}	-44627	-2116	94397	743	10461	792
Inflation	7.59	7.59	9.36	8.64	1.92	1.92

Similar patterns than for the full period data are observed in the case of NOPAT, IC and c^*. If the values of EVA_{nom} and EVA_{real} are compared, however, some differences become apparent. During the first and third inflation sub-periods, where inflation levels decreased, the average EVA_{real} value is lower than EVA_{nom}. During the second sub-period where inflation levels increased, the average EVA_{real} is larger than the average EVA_{nom}. If the median values are considered, EVA_{real} is larger than EVA_{nom} during the first two inflation sub-periods and lower for the third sub-period.

If the average and median inflation values are considered, it could be seen that it increased during the second sub-period (7.59% to 9.36%). During the final sub-period, inflation decreased to a substantially lower level of 1.92%.

6.3.2 DIFFERENCES BETWEEN EVA_{nom} AND EVA_{real}

In order to determine whether inflation has a significant effect on EVA, the statistical significance of the differences between EVA_{real}, EVA_{nom} and their components are investigated. The results from repeated measures analyses of variance are provided in Table 6.3.

Table 6.3: Parametric tests of differences between EVA_{nom}, EVA_{real} and their components

Differences between:	Full period	1991-1998	1999-2002	2003-2005
EVA_{real} and EVA_{nom}	1.550	4.253**	18.777***	7.334***
$NOPAT_{real}$ and $NOPAT_{nom}$	15.957***	32.528***	27.334***	13.253***
IC_{real} and IC_{nom}	4.254**	19.682***	12.703***	7.393***

Notes:

*** Significant at the 1% level

** Significant at the 5% level

Table 6.3 presents the *F*-values from repeated measures analyses of variance conducted to evaluate the differences between EVA_{real} and EVA_{nom}, and the nominal and real values of the EVA components NOPAT and IC. The first column contains the results for the full period. The other columns present the data for the three inflation sub periods 1991-1998, 1999-2002, and 2003-2005.

If the results for the full period are considered, the differences between EVA_{real} and EVA_{nom} are not statistically significant, while significant differences between the EVA components NOPAT and IC are observed. This could be ascribed to the differences in the behaviour of the two EVA versions during the different inflation sub-periods. To investigate the effect of changing levels of inflation, the tests were also conducted for the three inflation sub-periods. These results indicate that

statistically significant differences exist between the nominal and real values of all the variables during all three sub-periods.

A closer examination of the data reveals the inclusion of a large number of outliers. Consequently, non-parametric tests are also conducted to investigate the differences between the variables. The results of these tests are provided in Table 6.4:

Table 6.4: Non-parametric tests of differences between EVA_{nom}, EVA_{real} and their components

Differences between:	**Full period**	**1991-1998**	**1999-2002**	**2003-2005**
EVA_{real} and EVA_{nom}	8.969***	3.550***	19.918***	12.513***
$NOPAT_{real}$ and $NOPAT_{nom}$	47.488***	33.580***	24.914***	19.336***
IC_{real} and IC_{nom}	47.736***	33.446***	24.987***	19.962***

Notes:

*** Significant at the 1% level

Table 6.4 presents the *Z*-values from Wilcoxon matched pairs tests. The first column contains the results for the full period, while the last three columns present the data for the inflation sub periods 1991-1998, 1999-2002, and 2003-2005.

The results from the non-parametric tests indicate that at the 1% significance level, EVA_{real} is significantly larger than EVA_{nom}, $NOPAT_{real}$ is significantly lower than $NOPAT_{nom}$, and IC_{real} is significantly larger than IC_{nom}.

The correlations between the major components of EVA_{nom} and EVA_{real} for the full 15-year period are provided in Table 6.5.

Table 6.5: Correlations between the components of EVA_{nom} and EVA_{real}

	$NOPAT_{nom}$	**$NOPAT_{real}$**	**COSAdj**	**DeprAdj**	**GearAdj**	**IC_{nom}**	**IC_{real}**	**EVA_{nom}**	**EVA_{real}**	**Inflation**	c^*_{nom}
$NOPAT_{real}$	0.9915^{***}										
COSAdj	0.1981^{***}	0.1115^{***}									
DeprAdj	0.3302^{***}	0.2197^{***}	0.5155^{***}								
GearAdj	0.1300^{***}	0.1161^{***}	0.2067^{***}	0.5305^{***}							
IC_{nom}	0.4870^{***}	0.3887^{***}	0.5241^{***}	0.8193^{***}	0.2436^{***}						
IC_{real}	0.4500^{***}	0.3429^{***}	0.5386^{***}	0.9088^{***}	0.3281^{***}	0.9720^{***}					
EVA_{nom}	0.9308^{***}	0.9580^{***}	-0.0199	0.0625^{***}	0.0296	0.1700^{***}	0.1351^{***}				
EVA_{real}	0.9021^{***}	0.9371^{***}	0.0040	-0.0204	0.0002	0.1452^{***}	0.0807^{***}	0.9748^{***}			
Inflation	-0.0198	-0.0265	0.1837^{***}	-0.0223	-0.0397	-0.0473^{***}	-0.0371^{**}	-0.0120	0.0327^{*}		
c^*_{nom}	0.0033	0.0025	0.0822^{***}	0.0098	0.0557^{***}	-0.0191	-0.0051	-0.0625^{***}	-0.0652^{***}	0.1449^{***}	
c^*_{real}	0.0155	0.0190	-0.0422^{**}	0.0231	0.0741^{***}	0.0139	0.0195	-0.0475^{***}	-0.0775^{***}	-0.4926^{***}	0.7888^{***}

Notes:

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

The correlation between EVA_{nom} and EVA_{real} is high (0.9748). The correlations between EVA_{real} and the three inflation adjustments COSAdj, DeprAdj, and GearAdj are all low, and not statistically significant. A possible reason for this could be the changing levels of inflation during the full period investigated. The correlations between EVA_{real}, $NOPAT_{real}$, IC_{real} and $WACC_{real}$ are statistically significant at the 1% level, while the correlation between EVA_{real} and annual inflation is statistically significant at the 10% level.

The correlation between the annual inflation and COSAdj is statistically significant at the 1% level, but the correlation with DeprAdj and GearAdj is not significant. A possible explanation could be that DeprAdj is calculated by using the total inflation over the estimated asset age, rather than the annual inflation. The adjustment GearAdj is calculated by considering the net monetary asset / liability position of the firm, and does not directly incorporate the annual inflation.

6.3.3 REGRESSION ANALYSES

6.3.3.1 DIFFERENCES BETWEEN EVA_{nom} AND EVA_{real}

In order to investigate the differences between EVA_{nom} and EVA_{real}, the variables are standardised to size by dividing the measures by the invested capital at the beginning of the financial year (IC_{t-1}). The following variable, as defined by Warr (2005: 129), is then calculated:

$$\text{EVADIFF} = \frac{\text{EVA}_{real}}{\text{IC}_{real}} - \frac{\text{EVA}_{nom}}{\text{IC}_{nom}} \tag{6.4}$$

$$= \left[\frac{\text{NOPAT}_{real} - \left(c^*_{real} \text{ x } \text{IC}_{real}\right)}{\text{IC}_{real}}\right] - \left[\frac{\text{NOPAT}_{nom} - \left(c^*_{nom} \text{ x } \text{IC}_{nom}\right)}{\text{IC}_{nom}}\right] \tag{6.5}$$

$$= \left[\left(\frac{\text{NOPAT}_{real}}{\text{IC}_{real}}\right) - c^*_{real}\right] - \left[\left(\frac{\text{NOPAT}_{nom}}{\text{IC}_{nom}}\right) - c^*_{nom}\right] \tag{6.6}$$

$$= \left(ROIC_{real} - c^{*}_{real}\right) - \left(ROIC_{nom} - c^{*}_{nom}\right) \quad (6.7)$$

where:

$ROIC_{real}$ = the return on invested capital in real terms

$ROIC_{nom}$ = the return on invested capital in nominal terms

The value of EVADIFF, therefore, measures the difference between the excess return earned on the invested capital above the cost of capital (in real terms), and the excess return earned on the invested capital above the cost of capital (in nominal terms).

Figure 6.2 contains the median EVADIFF and median PPI values for the period under investigation.

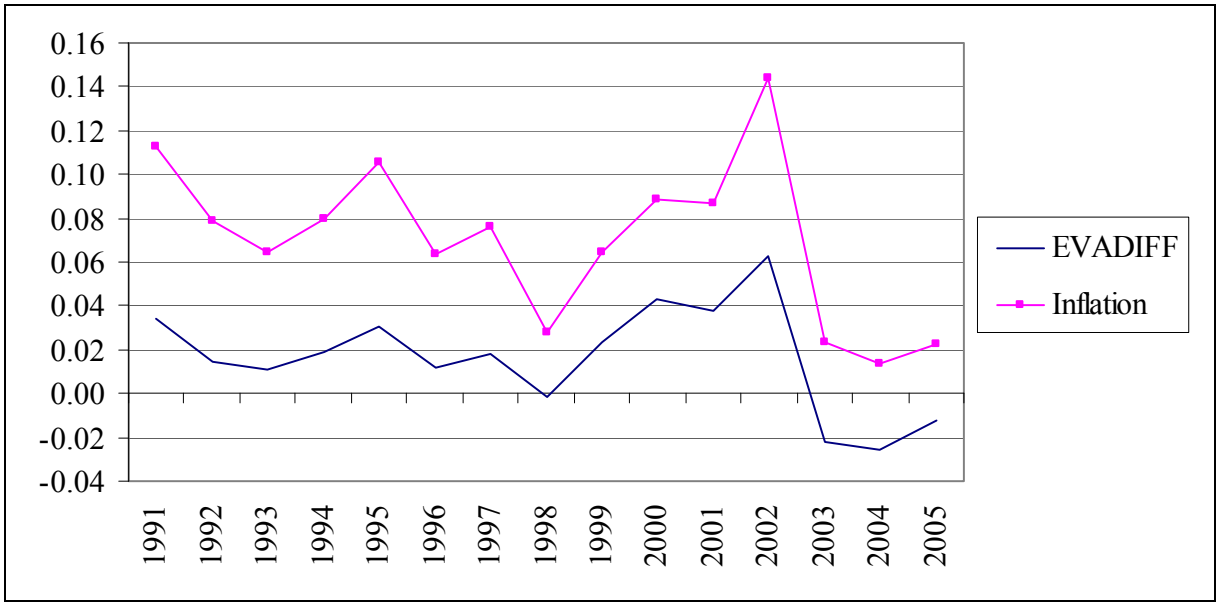


Figure 6.2: Median EVADIFF and PPI values for the period 1991 to 2005.

From the figure it may be seen that EVADIFF is positive for the majority of years. Negative values (i.e. the nominal excess return exceeds the real excess return) are only observed during

those periods of decreasing inflation where the inflation rate decreases to a level below four percent.

The correlations between the variables used in the regression analyses are provided in Table 6.6.

Table 6.6: Correlations between the variables used in regression analyses

	EVADIFF	Inflation	NetMonLiab Ratio	PPE Ratio	NetMonLiab Ratio x Inflation	PPE Ratio x PastInfl	AssetAge
Inflation	0.1390***						
NetMonLiab-ratio	0.2685***	-0.0042					
PPE-ratio	0.2067***	-0.0182	0.5129***				
NetMonLiab Ratio x Inflation	0.2915***	0.0391**	0.8745***	0.4138***			
PPE Ratio x PastInfl	-0.0182	0.0367**	0.2099***	0.2119***	0.1459***		
AssetAge	-0.1193***	-0.0579***	-0.0048	0.0357**	0.0107	0.6005***	
PastInfl	-0.0677***	0.0367**	-0.0382**	-0.0114	-0.0152	0.6228***	0.7336***

Notes:

EVADIFF = $(EVA_{real} / IC_{real}) - (EVA_{nom} / IC_{nom})$. NetMonLiab-ratio quantifies the gearing effect, and is calculated as net monetary liabilities divided by the sum of net monetary liabilities, non-monetary liabilities and the PPE adjustment. The PPE-ratio is the PPE divided by the invested capital. AssetAge is the estimated average age of the PPE. PastInfl is the change in the inflation index over the estimated asset age.

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

Statistically significant correlations between EVADIFF and most of the variables included in the regression analyses are reported. The only exception is the variable PPE ratio x PastInfl, where the correlation is not significant.

In order to determine the relationship between EVADIFF, and firm-specific characteristics, the following regression analysis is conducted:

$$\text{EVADIFF} = a_0 + a_1 \text{ Inflation} + a_2 \text{ NetMonLiab} + a_3 \text{ PPE ratio} + a_4 \text{ Asset age} + a_5 \text{ Past Inflation} + e_t \quad (6.8)$$

where:

EVADIFF	=	$(EVA_{real} / IC_{real}) - (EVA_{nom} / IC_{nom})$
Inflation	=	the annual inflation
NetMonLiab	=	the gearing effect, calculated as net monetary liabilities divided by the sum of net monetary liabilities, non-monetary liabilities and the PPE adjustment.
PPE ratio	=	PPE divided by the invested capital
AssetAge	=	the estimated average age of the PPE
Past Inflation	=	the change in the inflation index over the estimated asset age.

In Table 6.7 the results of the regression analyses of EVADIFF against inflation, leverage and asset structure are provided:

Table 6.7: Regression analyses of the difference between EVA_{real} and EVA_{nom} and inflation, level of gearing and asset structure

	Panel A: Full sample	
	Model 1	**Model 2**
Intercept	-0.0182 (-1.89)	0.0033 (0.35)
Inflation	0.6479*** (7.67)	0.5818*** (6.88)
NetMonLiab ratio	0.0491*** (10.93)	-
PPE ratio	0.0404*** (5.22)	-
NetMonLiab ratio x inflation	-	0.7803*** (16.68)
PPE ratio x past inflation	-	-0.0005 (-0.16)
Asset age	-0.0069*** (-5.83)	-0.0067*** (-5.40)
Past inflation	0.0022 (1.78)	0.0019 (1.44)
N	3070	3070
Adjusted R^2	0.1111	0.1137
	Panel B: 5 year + data	
	Model 1	**Model 2**
Intercept	0.0016 (0.57)	-0.0059** (-2.15)
Inflation	0.6158*** (24.76)	0.5920*** (23.71)
NetMonLiab ratio	0.0287*** (21.89)	-
PPE ratio	-0.0279*** (-12.24)	-
NetMonLiab ratio x inflation	-	0.2797*** (20.16)
PPE ratio x past inflation	-	0.0036*** (3.73)
Asset age	-0.0044*** (-12.61)	-0.0051*** (-14.02)
Past inflation	0.0002 (0.47)	-0.0002 (-0.49)
N	2885	2885
Adjusted R^2	0.3450	0.3423

Notes:

The dependent variable is EVADIFF = (EVA_{real} / IC_{real}) - (EVA_{nom} / IC_{nom}). NetMonLiab-ratio quantifies the gearing effect, and is calculated as net monetary liabilities divided by the sum of net monetary liabilities, non-monetary liabilities and the PPE adjustment. The PPE-ratio is the PPE divided by the invested capital. AssetAge is the estimated average age of the PPE. PastInfl is the change in the inflation index over the estimated asset age. Panel A contains the results for all the observations in the sample. Panel B includes only firms providing at least 5 years' data.

*** Significant at the 1% level

** Significant at the 5% level

Panel A of Table 6.7 contains the results for all the observations. In model 1 the relationships between EVADIFF, and the inflation rate, level of gearing, and asset structure are investigated.

The annual inflation exhibits a statistically significant positive relationship with EVADIFF. This implies that increasing levels of inflation result in larger differences between the two measures. The PPE ratio and the NetMonLiab ratio are both positively related to EVADIFF. This could be seen as an indication that the level of gearing, as well as the asset structure of the firm, influence the extent of the inflation distortion to EVA_{nom}. The estimated asset age is negatively related to EVADIFF. This result is to be expected, since a lower asset age should result in lower depreciation and PPE adjustments, reducing the difference between the two measures. The regression coefficient of the past inflation is positive and not significant, indicating that changes in inflation over the estimated asset age do not contribute significantly to EVADIFF. A possible explanation for this could be the variable inflation levels experienced in the South African economy.

In order to investigate the combined effect of inflation and the firm characteristics included in model 1, model 2 combines the NetMonLiab ratio with the annual inflation, and the PPE ratio with past inflation. A regression analysis based on the following equation is, therefore, also conducted:

$$\text{EVADIFF} = h_0 + h_1\ \text{Infl} + h_2\ (\text{NetMonLiab ratio x Inflation}) + h_3\ (\text{PPE ratio x Past inflation}) + h_4\ \text{Asset age} + h_5\ \text{PastInfl} + e_t \quad (6.9)$$

The regression coefficient of the variable (NetMonLiab ratio x Inflation) is positive, and significant. The inclusion of this variable also results in a decrease in the coefficient of the inflation variable. The coefficient of the variable (PPE ratio x Past inflation) is negative, but not significant. This could possibly be ascribed to the high levels of variation in past inflation during the period investigated.

In Panel B of Table 6.7 the same regression analyses are repeated. However, only those firms that provided at least 5 years' data are included in the analyses. This ensures that all firms that only existed for a short period of time are removed from the sample. Usually these would include those firms that experienced financial difficulty and those that exhibited unstable financial results.

The results obtained are similar in most cases, but it is important to note that the adjusted R^2 values for Panel B increased significantly from those observed in Panel A. Only two major differences are observed. The sign of the regression coefficient of the PPE ratio in model 1 changed from positive to negative, while the combined effect of PPE and the past inflation investigated in model 2 changed from a non-significant negative coefficient to a significant positive one.

6.3.3.2 CHANGES IN EVA_{nom} AND EVA_{real}

In most cases, changes in the level of EVA, rather than the absolute annual values, are used to evaluate a firm's financial performance (O'Byrne, 1996: 117; O'Byrne, 1997: 50). Based on these changes in the value of the measure, management and employees could be evaluated and rewarded accordingly.

In order to evaluate the relationship between changes in EVA_{nom} and EVA_{real}, and the changes in their components, the following regression analysis is conducted:

$$\Delta \text{ EVA} = j_0 + j_1 \Delta \text{ Inflation} + j_2 \Delta \text{ NOPAT} + j_3 \Delta \text{ IC} + e_t \quad (6.10)$$

where:

Δ EVA	=	the change in nominal (or real) EVA during the financial year
Δ Inflation	=	the change in inflation
Δ NOPAT	=	the change in nominal (or real) NOPAT
Δ IC	=	the change in nominal (or real) IC

Table 6.8 contains the results from the regression analyses conducted in order to investigate the sensitivity of changes in EVA_{nom} and EVA_{real} to changes in inflation, as well as changes in the components of EVA.

Table 6.8: Regression analyses of change in EVA_{real} and EVA_{nom}, and changes of major components of EVA and inflation

	Change in EVA_{nom}	**Change in EVA_{real}**
	Full sample	**Full sample**
Intercept	5815*** (4.00)	6139 (1.13)
Change in inflation	-149644*** (-4.94)	1967629*** (17.31)
Change in NOPAT	0.980*** (1266.08)	0.9714*** (347.84)
Change in IC_{nom}	-0.1243*** (-109.47)	-
Change in IC_{real}	-	-0.0330*** (-10.35)
N	2691	2691
R^2	0.9985	0.9800

Notes:

The dependent variables are the annual change in EVA_{nom} and the annual change in EVA_{real}. The change in EVA_{nom} is calculated as $EVA_{nom;t}$ - $EVA_{nom;t\text{-}1}$. The change in EVA_{real} is calculated as $EVA_{real;t}$ - $EVA_{real;t\text{-}1}$. The change in inflation is $inflation_t$ - $inflation_{t\text{-}1}$. The change in NOPAT is $NOPAT_t$ - $NOPAT_{t\text{-}1}$. The change in IC_{nom} is $IC_{nom;t}$ - $IC_{nom;t\text{-}1}$. The change in IC_{real} is $IC_{real;t}$ - $IC_{real;t\text{-}1}$. *t*-statistics are in parenthesis

*** Significant at the 1% level

If the annual changes in EVA_{nom} are considered, it can be seen that changes in inflation play an important role with a highly significant regression coefficient of –149644. Increased inflation, therefore, will result in decreases in the value of EVA_{nom}. The coefficients for the other two variables are both significant, with changes in EVA_{nom} having positive and negative relationships with changes in NOPAT and IC respectively. These relationships are as expected, since an increase in NOPAT and a decrease in IC would have a positive influence on a firm's EVA value.

In the case of changes in EVA_{real}, a large, positive regression coefficient is observed for the change in inflation. One possible explanation for this positive relationship between changes in EVA_{real} and inflation changes could be that during periods of increasing inflation, leveraged firms will generate an inflation gain on their debt capital (Warr, 2005: 135). This gain is not taxed, and results in increased levels of EVA_{real} for leveraged firms. The regression coefficients of the other two variables provide similar results to those obtained for changes in EVA_{nom}.

The same regression analyses are also conducted for the three inflation sub-periods. The results obtained from these analyses, however, are similar to the results reported above.

6.4 THE COMPONENTS OF EVA_{real}

In order to evaluate the relative and incremental information content of an inflation adjusted version of EVA and the measures operating cash flow (CFO), earnings before extraordinary items (EBEI), residual income (RI) and EVA in nominal terms, EVA_{real} is partitioned into its contributing components using the approach applied by Biddle *et al*. (1997). Based on this, EVA_{real} can be presented as follows:

$$EVA_{real} = CFO + Accrual + ATInt - CapChg + AcctAdj + InflAdj \quad (6.11)$$

$$= EVA_{nom} + InflAdj \quad (6.12)$$

where:

$$\text{CapChg} = c^{*}_{nom} \text{ x IC}$$

$$\text{AcctAdj} = \text{AcctAdj}_{op} - (c^{*}_{nom} \text{ x AcctAdj}_{c})$$

$$\text{InflAdj} = (\text{GearAdj} - \text{COSAdj} - \text{DeprAdj}) - \left[\left(\frac{\text{Infl}_{year}(c^{*}_{nom}+1)}{1+\text{Infl}_{year}} \text{ x IC}_{nom}\right) + \left(\frac{\text{Infl}_{year}(c^{*}_{nom}+1)}{1+\text{Infl}_{year}} \text{ x AcctAdj}_{c}\right) + (c^{*}_{real} \text{x PPEAdj})\right]$$

The components of the inflation-adjusted financial performance measures investigated in this study are provided in Figure 4.2 in Chapter 4. This chapter focuses on the measure EVA_{real}, and the relationships between the EVA_{real} components investigated are summarised in Figure 6.3 (Biddle *et al*., 1997: 307):

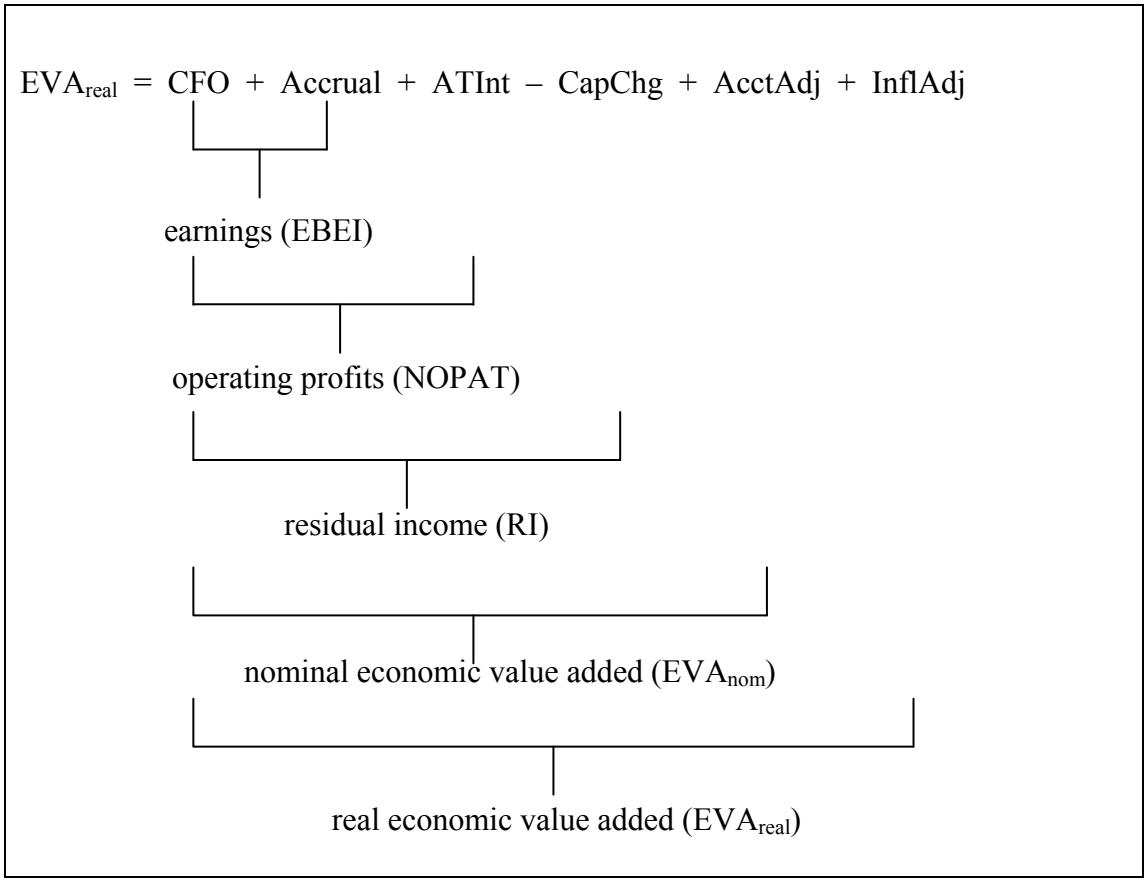


Figure 6.3: Components of inflation-adjusted economic value added (EVA_{real})

6.5 DESCRIPTIVE STATISTICS

6.5.1 MEASURES INCLUDED IN THE RELATIVE INFORMATION CONTENT TESTS

The descriptive statistics of the winsorised variables included in the relative information content tests of EVA_{real} pooled across time are provided in Table 6.9.

Table 6.9: Descriptive statistics on the dependent and independent variables in the relative information content tests of EVA_{real}

Descriptive statistics						
	Dependent Variable	**Independent Variables**				
	MktAdjRet	**EBEI**	**CFO**	**RI**	**EVA_{nom}**	**EVA_{real}**
Mean	0.114	0.180	0.269	-0.095	-0.148	-0.146
Median	0.010	0.119	0.142	-0.001	-0.021	-0.010
Std. Dev.	0.704	0.468	0.584	0.449	0.511	0.625
Correlations						
	Dependent Variable	**Independent Variables**				
	MktAdjRet	**EBEI**	**CFO**	**RI**	**EVA_{nom}**	**EVA_{real}**
MktAdjRet	1.000					
EBEI	0.332***	1.000				
CFO	0.198***	0.503***	1.000			
RI	0.192***	0.407***	0.047***	1.000		
EVA_{nom}	0.135***	0.298***	0.000	0.893***	1.000	
EVA_{real}	0.102***	0.254***	-0.020	0.748***	0.848***	1.000

Notes:

All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are divided by the market value of the equity as measured three months after the beginning of the financial year.

*** Significant at the 1% level

CFO exhibits the largest mean and median values followed by EBEI, RI, EVA_{real} and EVA_{nom} respectively. In the case of the value based measures RI, EVA_{real} and EVA_{nom}, the median values are all close to zero. To investigate the behaviour of the measures over time, the median values of the four measures are plotted in Figure 6.4.

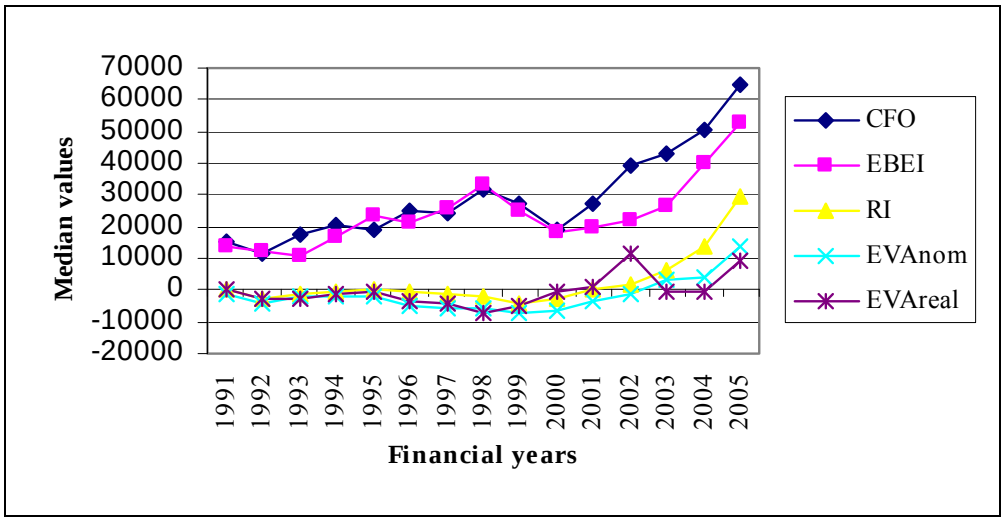


Figure 6.4: Median values of the measures CFO, EBEI, RI, EVA_{nom} and EVA_{real} for 1991 to 2005

The median EVA_{nom} and EVA_{real} values from 1991 to 2001 are all negative, while the last four years exhibit increasing values. The majority of the median RI values are negative during the period 1991 tot 2002 (eight negative values versus four positive), and are also followed by increasing positive values over the last three years. In a competitive economy most firms struggle to generate returns in excess of their costs of capital (Biddle *et al*., 1997). The period 1991 to 2002 reflects this pattern.

Statistically significant positive correlations are found between most of the measures. The correlations between CFO, and EVA_{nom} and EVA_{real}, however, are low and not statistically significant. When considering the dependent variable *MktAdjRet* the highest correlation is observed with EBEI.

6.5.2 COMPONENTS INCLUDED IN THE INCREMENTAL INFORMATION CONTENT TESTS

The descriptive data of the winsorised EVA_{real} components included in the incremental information content tests pooled across time are provided in Table 6.10.

Table 6.10: Descriptive statistics on the dependent and independent variables in the incremental information content tests

	Descriptive statistics						
	Dependent Variable	**Independent Variables**					
	MktAdjRet	**CFO**	**Accruals**	**ATInt**	**CapChg**	**AccAdj**	**InflAdj**
Mean	0.114	0.269	-0.067	0.077	0.349	-0.054	0.012
Median	0.010	0.142	-0.020	0.026	0.166	-0.015	0.008
Std. Dev.	0.704	0.584	0.509	0.137	0.519	0.229	0.287
	Correlations						
	Dependent Variable	**Independent Variables**					
	MktAdjRet	**CFO**	**Accruals**	**ATInt**	**CapChg**	**AccAdj**	**InflAdj**
MktAdjRet	1.000						
CFO	0.198***	1.000					
Accruals	0.042**	-0.485***	1.000				
ATInt	0.093***	0.261***	-0.121***	1.000			
CapChg	0.155***	0.463***	-0.073***	0.640***	1.000		
AccAdj	-0.065***	-0.064***	-0.006	-0.231***	-0.211***	1.000	
InflAdj	-0.024	-0.076***	0.023	0.220***	0.076***	0.006	1.000

Notes:

All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are deflated by the market value of the equity as measured three months after the beginning of the financial year.

*** Significant at the 1% level

** Significant at the 5% level

The mean and median values of both Accruals and AccAdj are negative. This is consistent with the smoothing effect of these components on CFO (Biddle *et al*., 1997). The significant negative correlation between CFO and Accruals and AccAdj

could be attributed to the same reason. Statistically significant positive correlations are found between CFO and ATInt and CapChg. According to Biddle *et al*. (1997) firms with higher CFO also have higher debt and equity costs. In terms of the *MktAdjRet* the highest correlation is observed between CFO and *MktAdjRet*. The correlation between *MktAdjRet* and InflAdj is negative and not significant.

6.6 RELATIVE INFORMATION CONTENT TESTS

The relative information content of the five measures EBEI, CFO, RI, EVA_{nom} and EVA_{real} are evaluated by comparing the adjusted R^2 values obtained from five separate regressions based on the following equation:

$$D_t = b_0 + b_1 X_t / MVE_{t-1} + b_2 X_{t-1} / MVE_{t-1} + e_t. \quad (6.12)$$

where:

D_t = the market-adjusted return for period t.
X = one of the five measures CFO, EBEI, RI, EVA_{nom} and EVA_{real}.
MVE_{t-1} = the market value of the equity three months after the beginning of the financial year.

The results from the relative information content tests are provided in Table 6.11.

Table 6.11: Tests of the relative information content of EVA_{real}, EVA_{nom}, residual income, earnings and operating cash flow

Relative information content										
Rank order of R^2	**Obs.**	**(1)**		**(2)**		**(3)**		**(4)**		**(5)**
Panel A:	**Coefficient of positive and negative values of each performance measure constrained to be equal [a]**									
All firms	**2660**	**EBEI**	**>**	**RI**	**>**	**CFO**	**>**	**EVA_{nom}**	**>**	**EVA_{real}**
Adj. R^2		0.0989		0.0409		0.0361		0.0281		0.0112
Panel B:	**Coefficient of positive and negative values of each performance measure allowed to differ [b]**									
All firms	**2660**	**EBEI**	**>**	**RI**	**>**	**CFO**	**>**	**EVA_{nom}**	**>**	**EVA_{real}**
Adj. R^2		0.1536		0.1287		0.0846		0.0753		0.0609

Notes:

[a] In Panel A, the regression based on Equation (6.12) is conducted, where: $D_t = b_0 + b_1 X_t / MVE_{t-1} + b_2 X_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the five measures CFO, EBEI, RI, EVA_{nom} and EVA_{real}, and MVE is the market value of the equity three months after the beginning of the financial year.

[b] In Panel B, the regression used in Panel A is adjusted to allow different coefficients for positive and negative values of the independent variable: $D_t = c_0 + c_1 X_{t;pos} / MVE_{t-1} + c_2 X_{t;neg} / MVE_{t-1} + c_3 X_{t-1;pos} / MVE_{t-1} + c_4 X_{t-1;neg} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the five measures CFO, EBEI, RI, EVA_{nom} and EVA_{real}, and MVE is the market value of the equity three months after the beginning of the financial year.

Panel A of Table 6.11 contains the adjusted R^2 values of the five separate regressions. The measures are arranged in decreasing sequence based on their adjusted R^2 values. EBEI has a significantly higher adjusted R^2 value (0.0989) than the other measures. It is followed by RI (0.0409), CFO (0.0361), EVA_{nom} (0.0281) and EVA_{real} (0.0112) respectively. In terms of information content EBEI, therefore, outperforms the other measures.

According to Hayn (1995), Burgstahler and Dichev (1997) and Collins *et al*. (1997) profitable firms exhibit larger earnings responses than loss-making firms. O'Byrne (1997) also recommends a distinction between positive and negative EVA values. The tests for relative information content are repeated after allowing different coefficients for positive and negative values:

$$D_t = c_0 + c_1 X_{t;\text{pos}} / \text{MVE}_{t-1} + c_2 X_{t;\text{neg}} / \text{MVE}_{t-1} + c_3 X_{t-1;\text{pos}} / \text{MVE}_{t-1} + c_4 X_{t-1;\text{neg}} / \text{MVE}_{t-1} + e_t \quad (6.13)$$

The results from these regressions are provided in Panel B of Table 6.11. A similar ranking to the one in Panel A is observed, but all the measures exhibit significantly higher adjusted R^2 values. EBEI still outperforms the other measures with an adjusted R^2 value of 0.1536. When considering the value based measures, large increases in the adjusted R^2 values for RI and EVA_{real} are reported.

6.7 INCREMENTAL INFORMATION CONTENT TESTS OF THE EVA_{real} COMPONENTS

The incremental information contents of the EVA components are evaluated by conducting the following regression:

$$\begin{aligned} MktAdjRet_t = {} & d_0 + d_1 \text{CFO}_t / \text{MVE}_{t-1} + d_2 \text{CFO}_{t-1} / \text{MVE}_{t-1} + \\ & d_3 \text{Accrual}_t / \text{MVE}_{t-1} + d_4 \text{Accrual}_{t-1} / \text{MVE}_{t-1} + \\ & d_5 \text{ATInt}_t / \text{MVE}_{t-1} + d_6 \text{ATInt}_{t-1} / \text{MVE}_{t-1} + \\ & d_7 \text{CapChg}_t / \text{MVE}_{t-1} + d_8 \text{CapChg}_{t-1} / \text{MVE}_{t-1} + \\ & d_9 \text{AcctAdj}_t / \text{MVE}_{t-1} + d_{10} \text{AcctAdj}_{t-1} / \text{MVE}_{t-1} + \\ & d_{11} \text{InflAdj}_t / \text{MVE}_{t-1} + d_{12} \text{InflAdj}_{t-1} / \text{MVE}_{t-1} + e_t \end{aligned} \quad (6.14)$$

The results of the incremental information content tests are provided in Table 6.12.

Table 6.12: Tests of incremental information content of EVA_{real} components: CFO, operating accruals, after-tax interest, capital charge, accounting adjustments and inflation adjustments

	All firms [a]	***t*-stat**	***F*-stat**	***p*-value** [b]
Obs.	2660			
Constant	0.095	6.09***		
CFO_t	0.243	7.83***	37.83	<0.0001
CFO_{t-1}	0.017	0.57		
$Accrual_t$	0.197	6.34***	27.89	<0.0001
$Accrual_{t-1}$	0.053	1.74*		
$ATInt_t$	1.033	5.60***	17.49	<0.0001
$ATInt_{t-1}$	-0.989	-5.42***		
$CapChg_t$	0.490	8.98***	62.42	<0.0001
$CapChg_{t-1}$	-0.617	-11.15***		
$AccAdj_t$	-0.103	-1.77*	2.04	0.1299
$AccAdj_{t-1}$	-0.033	-0.58		
$InflAdj_t$	-0.069	-1.32	1.54	0.2151
$InflAdj_{t-1}$	-0.013	-0.24		

Notes:

[a] The regression based on Equation (6.14) is conducted: $MktAdjRet_t = d_0 + d_1\ CFO_t / MVE_{t-1} + d_2\ CFO_{t-1} / MVE_{t-1} + d_3\ Accrual_t / MVE_{t-1} + d_4\ Accrual_{t-1} / MVE_{t-1} + d_5\ ATInt_t / MVE_{t-1} + d_6\ ATInt_{t-1} / MVE_{t-1} + d_7\ CapChg_t / MVE_{t-1} + d_8\ CapChg_{t-1} / MVE_{t-1} + d_9\ AcctAdj_t / MVE_{t-1} + d_{10}\ AcctAdj_{t-1} / MVE_{t-1} + d_{11}\ InflAdj_t / MVE_{t-1} + d_{12}\ InflAdj_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, while the independent variables are the EVA_{real} components (CFO, accruals, after-tax finance cost, capital charge, accounting adjustments and inflation adjustments). MVE is the market value of equity three months after the start of the financial year.

[b] *p*-values in parentheses represent non-directional *F*-test of the null hypothesis of no incremental information content (Hypothesis H_{INC})

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

The adjusted R^2 value for the regression based on Equation (6.14) is 0.1861. Perusal of Table 6.12 indicates that the regression coefficients of the current year's CFO (CFO_t), accruals ($Accrual_t$), the after-tax interest expense ($ATInt_t$) and the capital charge ($CapChg_t$) are all statistically significant at the 0.01 level. Collectively these components represent the firm's current year's RI. Other regression coefficients that are statistically significant at the 0.01 level are those for $AtInt_{t-1}$ and $CapChg_{t-1}$. If the regression coefficients of the accounting and inflation adjustments are considered, only $AccAdj_t$ is significant (at the 0.10 level).

If the *F*-statistics are considered, it may be seen that the RI components CFO, Accruals, ATInt and CapChg provide the largest incremental information contributions. The *F*-statistics for AccAdj and InflAdj, however, are not statistically significant and exhibit much lower values (2.04 and 1.54 respectively).

6.8 SUMMARY

While proponents of the measure EVA argue that changes in the measure are not influenced by inflation rate fluctuations, a number of studies have nevertheless cautioned against the possible distorting effects that inflation could have on the value of the measure. The first sections of this chapter investigate the effects of inflation changes on EVA during a period of highly variable inflation rates. This is achieved by calculating an inflation-adjusted version of the measure and comparing it to its nominal value.

The results indicate that statistically significant differences occur between the nominal and real values of the measure EVA during periods of increasing, decreasing and low levels of inflation. When the differences between the nominal and real EVA values are investigated, it becomes clear that inflation played a key role. It is also important, however, to consider the firm's level of gearing as well as its asset structure and age since these firm specific characteristics will influence the extent of the inflation distortion. If EVA is applied to evaluate and compare the financial performance of

firms during periods of inflation it is, therefore, important to bear in mind that firm-specific characteristics may influence its value.

Based on the overall results it would appear that the value of EVA_{nom} is lower than EVA_{real} during periods of inflation. Analysts applying the nominal version of the measure to evaluate a firm's financial performance, therefore, face the risk of underestimating its value. During periods of low, decreasing inflation (at inflation levels below four percent), however, the opposite is observed with median EVA_{nom} values exceeding the median EVA_{real} values. Applying EVA_{nom} under these circumstances results in an overvaluation of the firm's financial performance.

In the latter part of this chapter the information content of an inflation-adjusted version of the measure EVA is compared to that of the measures EVA_{nom}, RI, EBEI and CFO to determine if EVA_{real} is able to outperform the other measures in explaining share returns. An approach similar to Biddle *et al*. (1997) is applied to a sample of South African industrial firms to evaluate the relative information content of the individual measures, as well as the incremental information content of the EVA_{real} components.

The results of the study indicate that the inflation-adjusted EVA does not outperform nominal EVA in explaining market adjusted share returns. Furthermore, neither of the two EVA versions is able to outperform earnings (EBEI). In the majority of the tests the two EVA versions also do not manage to outperform RI. This analysis shows that the accounting and inflation adjustments required to calculate EVA_{real} do not add any significant information.

The incremental information content tests indicate that the EVA_{real} components do not add any significant additional information content beyond that contained in residual income. More specifically, it appears that the accounting and inflation adjustments required to calculate EVA_{real} do not add statistically significant incremental information content. Based on the results reported in this chapter, claims that EVA outperforms other financial performance measures can still not be supported. The incremental information content of the inflation adjustments also does not contribute additional information content.

In Chapter 5, the evaluation of the information content of nominal EVA indicates that the measure does not outperform accounting earnings (EBEI). This chapter investigates the performance of the measure EVA after the inclusion of the IAS15 inflation adjustments, and yields largely similar results to those reported in Chapter 5. In the next chapter of this study, the information content of the measure cash value added (CVA) is evaluated to determine whether it provides improved results.

Chapter 7

THE INFORMATION CONTENT OF CASH VALUE ADDED

7.1 INTRODUCTION

In Chapter 5 the information content of the value based financial performance measure EVA was investigated, while an inflation-adjusted version of the measure was evaluated in Chapter 6. The results reported in these chapters indicate that both versions of EVA are not able to outperform the traditional financial performance measure earnings (EBEI) when explaining the variation in a firm's market adjusted share returns.

The measure CVA is considered as another variant of residual income (Young & O'Byrne, 2001: 428). Similar to the calculation of EVA, a capital charge based on the capital invested in the firm is included. Instead of using economic profit figures, however, CVA calculates the excess cash flows generated over a capital charge based on the gross amount of invested capital. It is considered to be a combination of EVA and cash flow return on investment (CFROI) (Gupta & MacDonald, 2000: 237). According to Martin and Petty (2000: 128) CVA includes all the benefits of EVA while also attempting to improve on it by using cash flow instead of profit figures.

Relatively little empirical research, however, has focused on the relationship between CVA and share returns. This chapter investigates the ability of the measure CVA to explain market adjusted share returns for a sample of firms listed in the Industrial Sector of the Johannesburg Securities Exchange (JSE) and compares it to that of the financial performance measures economic value added (EVA), residual income (RI), earnings before extraordinary items (EBEI) and operating cash flow (CFO).

The remainder of this chapter consists of seven sections. The first section of the chapter provides the theoretical breakdown of CVA into its contributing components. In the second section, a brief description of the data included in this analysis is provided. The third section contains the descriptive statistics of the measures and components evaluated in relative and incremental information content tests. In the fourth section of the chapter the relative information content of the measure CVA relative to EVA, RI, EBEI and CFO is evaluated. The fifth section of the chapter investigates the incremental information content of the CVA components, and tests whether the inclusion of these components contributes significantly to the information content of the other measures. The sixth section investigates the performance of an inflation-adjusted version of CVA. The final section presents the summary and conclusions.

7.2 THE COMPONENTS OF CVA

A firm's CVA is calculated by considering the operating cash flow rather than operating profit (as was the case for EVA), and subtracting the gross capital charge. To convert NOPAT into the operating cash flow, depreciation and amortisation are added back (Martin & Petty, 2000: 128). Changes in other long-term liabilities, such as provisions and deferred taxes, are also added to NOPAT to convert it into a cash flow figure (Young & O'Byrne, 2001: 441). The capital charge is based on the gross value of the invested capital and not on the net figure (Martin & Petty, 2000: 141). Accumulated depreciation is, therefore, added back to the invested capital. Consequently, a firm's nominal CVA (CVA_{nom}) can be determined as follows:

$$CVA_{nom;\,t} = \text{Operating cash flow} - \text{gross capital charge}$$

$$= (NOPAT_{nom;\,t} + CVAAdj_{op;\,t}) - [c^{*}_{nom} \times (IC_{nom;\,t-1} + AccDepr_{t-1})] \quad (7.1)$$

where:

$CVAAdj_{op;\,t}$ = Depreciation, amortisation and changes in other long term liabilities

$AccDepr_{t-1}$ = Accumulated depreciation

This chapter studies the relative and incremental information content of CVA and the measures CFO, EBEI, RI and EVA. In order to do this, CVA is partitioned into its contributing components using an approach applied by Biddle *et al*. (1997: 305). According to this approach, CVA_{nom} may be presented as follows:

$$CVA_{nom} = CFO + Accrual + ATInt - CapChg + AcctAdj + CVAAdj \quad (7.2)$$

$$= EVA_{nom} + CVAAdj \quad (7.3)$$

where:

$CapChg = c^{*}_{nom} \times IC_{nom;\,t-1}$

$AcctAdj = AcctAdj_{op;\,t} - (c^{*}_{nom} \times AcctAdj_{c;\,t})$

$CVAAdj = CVAAdj_{op;\,t} - AcctAdj_{op;\,t} + [c^{*}_{nom} \times (AcctAdj_{c;\,t} + AccDepr_{t-1})]$

The relationship between the CVA_{nom} components is summarised in Figure 7.1 (Biddle *et al*., 1997: 307):

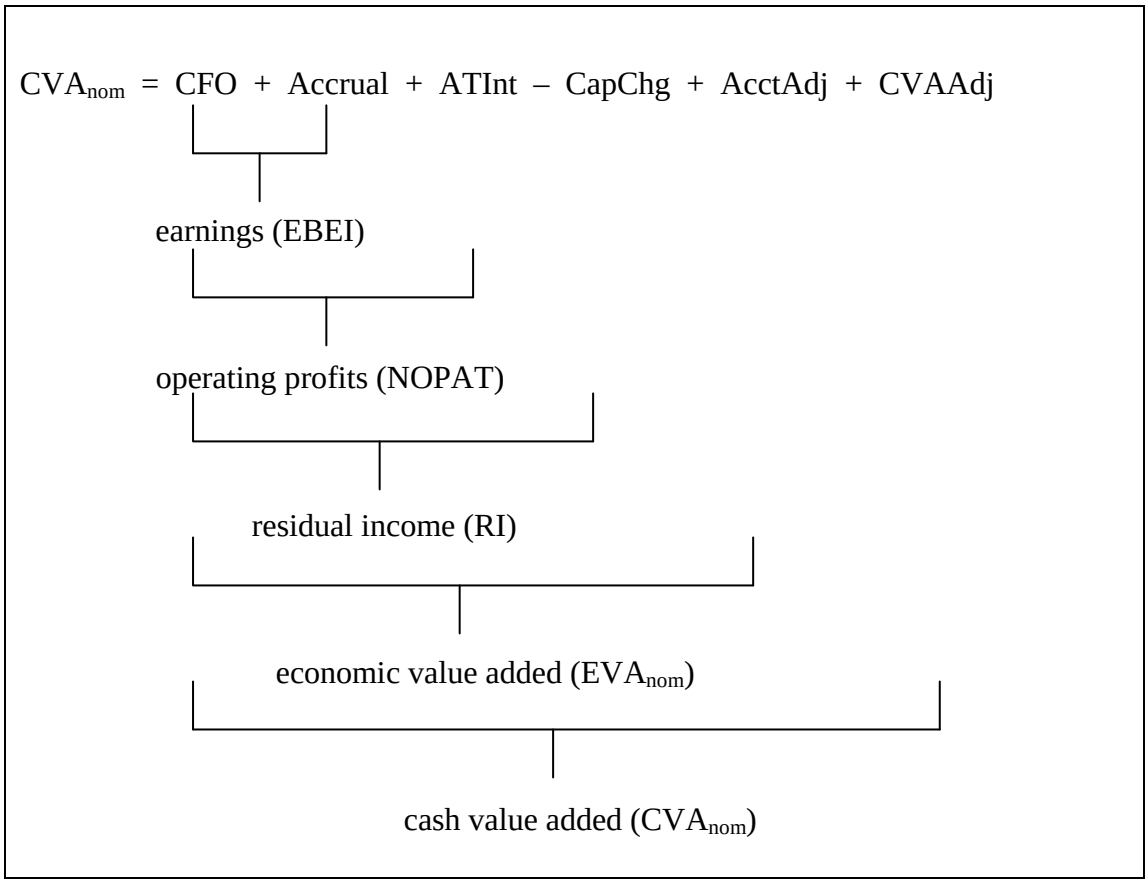


Figure 7.1: Components of nominal cash value added (CVA_{nom})

7.3 DATA

The measures CFO, EBEI, RI, EVA_{nom} and CVA_{nom}, as well as their contributing components, are calculated for all firms listed in the industrial sector of the JSE during the 15-year period from 1991 to 2005. The calculation of these measures is discussed in greater detail in Appendix 2.

To reduce heteroscedasticity in the data, all the independent variables are divided by the market value of equity as measured three months after the beginning of the firm's financial year (MVE_{t-1}) (Biddle *et al*., 1997: 313). This period is chosen to correspond with the period over which the dependent variable is calculated. By dividing the values of the measures by the market value of the equity, the independent variables are adjusted for the size of the firms.

Following Biddle *et al.* (1997: 311), those observations in excess of eight standard deviations from the median are classified as extreme outliers, and consequently 42 observations were removed from the sample. Both the dependent and independent variables are also winsorised to ± four standard deviations from the median. The final sample included in the analyses conducted in this chapter consists of 333 firms providing a total of 3 022 complete observations.

7.4 DESCRIPTIVE STATISTICS

7.4.1 MEASURES INCLUDED IN THE RELATIVE INFORMATION CONTENT TESTS

The descriptive statistics of the winsorised variables included in the relative information content tests pooled across time are provided in Table 7.1.

Table 7.1: Descriptive statistics on the dependent and independent variables in the relative information content tests of CVA_{nom}

	Descriptive statistics					
	Dependent Variable	**Independent Variables**				
	MktAdjRet	**EBEI**	**CFO**	**RI**	**EVA_{nom}**	**CVA_{nom}**
Mean	0.115	0.181	0.271	-0.094	-0.147	-0.111
Median	0.011	0.119	0.142	-0.001	-0.021	-0.007
Std. Dev.	0.701	0.466	0.580	0.447	0.509	0.523
	Correlations					
	Dependent Variable	**Independent Variables**				
	MktAdjRet	**EBEI**	**CFO**	**RI**	**EVA_{nom}**	**CVA_{nom}**
MktAdjRet	1.000					
EBEI	0.328***	1.000				
CFO	0.204***	0.507***	1.000			
RI	0.188***	0.403***	0.047***	1.000		
EVA_{nom}	0.132***	0.293***	-0.003	0.893***	1.000	
CVA_{nom}	0.137***	0.325***	0.061***	0.875***	0.971***	1.000

Notes:

All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are divided by the market value of the equity as measured three months after the beginning of the financial year.

*** Significant at the 1% level

The measure CFO once again exhibits the largest mean and median values, followed by EBEI, RI, CVA_{nom} and EVA_{nom} respectively. In the case of the three value based measures CVA_{nom}, EVA_{nom} and RI, the median values are all close to zero. To investigate the behaviour of the measures over time, the median values of the five measures are plotted in Figure 7.2.

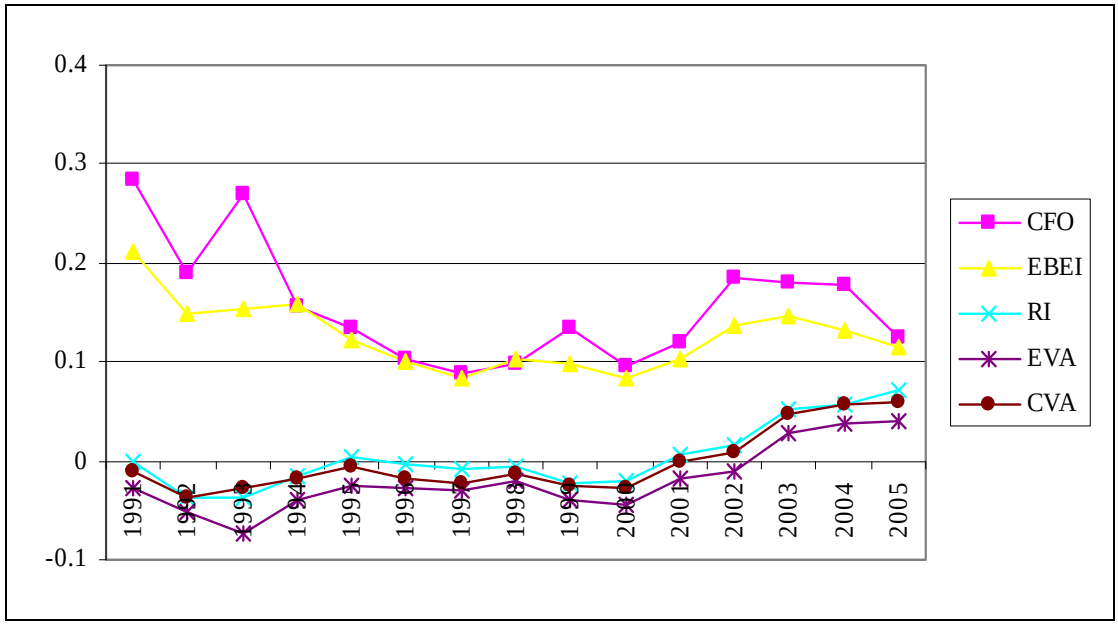


Figure 7.2: Median values of the measures CFO, EBEI, RI, EVA_{nom} and CVA_{nom} for the period 1991 to 2005

The median CVA_{nom} and RI values from 1991 to 2000 are all negative, while the last five years exhibit increasing positive values. The median EVA_{nom} values are negative from 1991 to 2002, and positive from 2003 to 2005. In a competitive economy, most

firms struggle to generate returns in excess of their costs of capital (Biddle *et al*., 1997: 313). For the majority of years the median values of all three value based measures remain close to zero.

In accordance with the patterns reported by Biddle *et al*. (1997: 313), statistically significant positive correlations are found between most of the measures. The correlation between CFO and EVA_{nom}, however, is not statistically significant. In terms of the dependent variable *MktAdjRet*, the highest correlation is observed for EBEI.

7.4.2 COMPONENTS INCLUDED IN THE INCREMENTAL INFORMATION CONTENT TESTS

The descriptive data of the winsorised CVA_{nom} components included in the incremental information content tests pooled across time are provided in Table 7.2.

Table 7.2: Descriptive statistics on the dependent and independent variables in the incremental information content tests of CVA_{nom} components

	Descriptive statistics						
	Dependent Variable	**Independent Variables**					
	MktAdjRet	**CFO**	**Accruals**	**ATInt**	**CapChg**	**AccAdj**	**CVAAdj**
Mean	0.115	0.271	-0.068	0.076	0.348	-0.054	0.034
Median	0.011	0.142	-0.020	0.026	0.166	-0.015	0.014
Std. Dev.	0.701	0.580	0.506	0.134	0.517	0.228	0.108
	Correlations						
	Dependent Variable	**Independent Variables**					
	MktAdjRet	**CFO**	**Accruals**	**ATInt**	**CapChg**	**AccAdj**	**CVAAdj**
MktAdjRet	1.000						
CFO	0.204***	1.000					
Accruals	0.034*	-0.481***	1.000				
ATInt	0.089***	0.277***	-0.131***	1.000			
CapChg	0.148***	0.476***	-0.081***	0.637***	1.000		
AccAdj	-0.062***	-0.070***	-0.002	-0.226***	-0.207***	1.000	
CVAAdj	-0.036**	0.189***	-0.065***	0.361***	0.153***	-0.054***	1.000

Notes:

All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are deflated by the market value of the equity as measured three months after the beginning of the financial year.

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

The mean and median values of both Accruals and AccAdj are negative. This is consistent with the smoothing effect of these components on CFO (Biddle *et al*., 1997: 316). The significant negative correlation between CFO, and Accruals and AccAdj could be attributed to the same reason. Statistically significant positive correlations are found between CFO, ATInt and CapChg. According to Biddle *et al*. (1997: 316), firms with higher CFO also have higher debt and equity costs. In terms of the dependent variable the highest correlation is observed between *MktAdjRet* and CFO.

7.5 RELATIVE INFORMATION CONTENT TESTS

The relative information content of the five measures EBEI, CFO, RI, EVA_{nom} and CVA_{nom} are evaluated by comparing the adjusted R^2 values for five separate regressions based on the following equation:

$$D_t = b_0 + b_1 X_t / MVE_{t-1} + b_2 X_{t-1} / MVE_{t-1} + e_t. \quad (7.4)$$

where:

D_t = The market-adjusted return for period *t*,

X = One of the five measures CFO, EBEI, RI, EVA_{nom} and CVA_{nom}

MVE_{t-1} = The market value of the equity three months after the beginning of the financial year.

The results from the relative information content tests are provided in Table 7.3.

Table 7.3: Tests of the relative information content of CVA_{nom}, EVA_{nom}, residual income, earnings and operating cash flow

Relative information content										
Rank order of R^2	**Observations**	**(1)**		**(2)**		**(3)**		**(4)**		**(5)**
Panel A: Coefficient of the positive and negative values of each performance measure constrained to be equal[a]										
All firms	**2650**	**EBEI**	**>**	**CFO**	**>**	**RI**	**>**	**EVA_{nom}**	**>**	**CVA_{nom}**
Adj. R^2		0.1016		0.0444		0.0394		0.0262		0.0227
Panel B: Coefficient of positive and negative values of each performance measure allowed to differ [b]										
All firms	**2650**	**EBEI**	**>**	**RI**	**>**	**CFO**	**>**	**CVA_{nom}**	**>**	**EVA_{nom}**
Adj. R^2		0.1537		0.1232		0.0841		0.0818		0.0735

Notes:

[a] In Panel A, the regression based on Equation (7.4) is conducted, where: $D_t = b_0 + b_1 X_t / MVE_{t-1} + b_2 X_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the five measures CFO, EBEI, RI, EVA_{nom} and CVA_{nom}, and MVE is the market value of the equity three months after the beginning of the financial year.

[b] In Panel B, the regression used in Panel A is adjusted to allow different coefficients for positive and negative values of the independent variable. $D_t = c_0 + c_1 X_{t;pos} / MVE_{t-1} + c_2 X_{t;neg} / MVE_{t-1} + c_3 X_{t-1;pos} / MVE_{t-1} + c_4 X_{t-1;neg} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the five measures CFO, EBEI, RI, EVA_{nom} and CVA_{nom}, and MVE is the market value of the equity three months after the beginning of the financial year.

Panel A of Table 7.3 contains the adjusted R^2 values of the five separate regressions. The measures are arranged in decreasing sequence based on their adjusted R^2 values. EBEI once again has a significantly higher adjusted R^2 value (0.1016) than the other measures. It is followed by CFO (0.0444), RI (0.0394), EVA_{nom} (0.0262) and CVA_{nom} (0.0227). In terms of information content, EBEI, therefore, again manages to outperform the other measures.

According to Hayn (1995: 127), Burgstahler and Dichev (1997: 192) and Collins *et al.* (1997) profitable firms exhibit larger earnings responses than loss-making firms. O'Byrne (1997: 51) also recommends a distinction between positive and negative EVA values. The tests for relative information content are repeated after allowing different coefficients for positive and negative values:

$$D_t = c_0 + c_1 X_{t;\text{pos}} / \text{MVE}_{t-1} + c_2 X_{t;\text{neg}} / \text{MVE}_{t-1} + c_3 X_{t-1;\text{pos}} / \text{MVE}_{t-1} + c_4 X_{t-1;\text{neg}} / \text{MVE}_{t-1} + e_t \quad (7.5)$$

The results from these regressions are provided in Panel B of Table 7.3. All the measures exhibit higher adjusted R^2 values. EBEI (0.1537) still exhibits the highest value compared to the other measures. It is followed by RI, which experienced the largest increase (0.0394 to 0.1232) in its adjusted R^2 value. It is followed by CFO (0.0841), CVA_{nom} (0.0818) and EVA_{nom} (0.0735).

7.6 INCREMENTAL INFORMATION CONTENT TESTS OF THE CVA_{nom} COMPONENTS

The incremental information contents of the CVA_{nom} components are evaluated by conducting the following regression:

$$MktAdjRet_t = d_0 + d_1\ CFO_t / MVE_{t-1} + d_2\ CFO_{t-1} / MVE_{t-1} + d_3\ Accrual_t / MVE_{t-1} + d_4\ Accrual_{t-1} / MVE_{t-1} + d_5\ ATInt_t / MVE_{t-1} + d_6\ ATInt_{t-1} / MVE_{t-1} + d_7\ CapChg_t / MVE_{t-1} + d_8\ CapChg_{t-1} / MVE_{t-1} + d_9\ AcctAdj_t / MVE_{t-1} + d_{10}\ AcctAdj_{t-1} / MVE_{t-1} + d_{11}\ CVAAdj_t / MVE_{t-1} + d_{12}\ CVAAdj_{t-1} / MVE_{t-1} + e_t \quad (7.6)$$

The results of the incremental information content tests are provided in Table 7.4.

Table 7.4: Tests of incremental information content of CVA_{nom} components: CFO, operating accruals, after-tax interest, capital charge, accounting adjustments and cash value added adjustments

	All firms [a]	***t*-stat**	***F*-stat**	***p*-value** [b]
Observations	2650			
Constant	0.098	6.27***		
CFO_t	0.254	8.05***	41.13	<0.0001
CFO_{t-1}	0.029	0.94		
$Accrual_t$	0.182	5.77***	23.54	<0.0001
$Accrual_{t-1}$	0.051	1.68*		
$ATInt_t$	1.093	5.52***	16.72	<0.0001
$ATInt_{t-1}$	-1.003	-5.20***		
$CapChg_t$	0.479	8.65***	60.09	<0.0001
$CapChg_{t-1}$	-0.619	-10.95***		
$AccAdj_t$	-0.117	-1.99**	2.46	0.0856
$AccAdj_{t-1}$	-0.036	-0.61		
$CVAAdj_t$	0.141	0.76	3.27	0.038
$CVAAdj_{t-1}$	-0.408	-2.22**		

Notes:

[a] The regression based on Equation (7.6) is conducted: $MktAdjRet_t = d_0 + d_1\ CFO_t / MVE_{t-1} + d_2\ CFO_{t-1} / MVE_{t-1} + d_3\ Accrual_t / MVE_{t-1} + d_4\ Accrual_{t-1} / MVE_{t-1} + d_5\ ATInt_t / MVE_{t-1} + d_6\ ATInt_{t-1} / MVE_{t-1} + d_7\ CapChg_t / MVE_{t-1} + d_8\ CapChg_{t-1} / MVE_{t-1} + d_9\ AcctAdj_t / MVE_{t-1} + d_{10}\ AcctAdj_{t-1} / MVE_{t-1} + d_{11}\ CVAAdj_t / MVE_{t-1} + d_{12}\ CVAAdj_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, while the independent variables are CVA_{nom} components (CFO, accruals, after-tax finance cost, capital charge, accounting adjustments and cash value added adjustments). MVE is the market value of equity three months after the start of the financial year.

[b] p-values in parentheses represent non-directional F-test of the null hypothesis of no incremental information content (Hypothesis H_{INC})

[***] Significant at the 1% level

[**] Significant at the 5% level

[*] Significant at the 10% level

The adjusted R^2 value for the regression based on Equation (7.6) amounts to 0.1880. This value is slightly higher than the value reported for the EVA_{real} components (0.1861) in Chapter 6. Perusal of Table 7.4 indicates that the regression coefficients of the current year's CFO (CFO_t), accruals ($Accrual_t$), the after-tax interest expense ($ATInt_t$) and the capital charge ($CapChg_t$) are all statistically significant at the 0.01 level. Collectively these components represent the firm's current year's RI. Other regression coefficients that are statistically significant at the 0.01 level are those for $ATInt_{t-1}$ and $CapChg_{t-1}$. If the regression coefficients of the accounting and cash value added adjustments are considered $AccAdj_t$ and $CVAAdj_{t-1}$ are significant (at the 0.05 level).

If the F-statistics are considered, it can be seen that the RI components CFO, Accruals, ATInt and CapChg provide the largest incremental information contributions. The F-statistics for AccAdj and InflAdj are also statistically significant (at the 0.10 and 0.05 levels respectively), but exhibit much lower F-values (2.46 and 3.27 respectively). Based on these results, it appears that RI contains most of the information content, and that the inclusion of the components required to quantify CVA_{nom} does not contribute economically significant information content.

7.7 INFLATION-ADJUSTED CVA AND EVA

In the previous chapter, the IAS15 inflation adjustments were included in the calculation of an inflation-adjusted version of the measure EVA. In order to evaluate the effect of changing inflation levels on the measure CVA, these inflation adjustments are also included in the calculation of an inflation-adjusted version of the measure (CVA_{real}). The calculation of the inflation adjustments, as well as CVA_{real} is set out in detail in Appendix 3.

In Chapter 6, it was shown that EVA_{real} is calculated as follows:

$$EVA_{real;\,t} = NOPAT_{real;\,t} - (c^{*}_{real} \times IC_{real;\,t-1}) \quad (7.7)$$

$$= (NOPAT_{nom;\,t} - COSAdj_t - DeprAdj_t \pm GearAdj_t) - [c^{*}_{real} \times (IC_{nom;\,t-1} + PPEAdj_t)] \quad (7.8)$$

where:

$EVA_{real;\,t}$ = EVA in real terms, calculated after the inflation adjustments to NOPAT and invested capital are included

$NOPAT_{real;\,t}$ = NOPAT after including the cost of sales, depreciation and gearing adjustments

c^{*}_{real} = the inflation-adjusted cost of capital

$IC_{real;\,t-1}$ = the invested capital after including the PPE inflation adjustment

CVA_{real} is calculated as follows:

$$CVA_{real;\,t} = (NOPAT_{nom;\,t} + CVAAdj_{op;\,t} - COSAdj_t - DeprAdj_t \pm GearAdj_t) - [c^{*}_{real} \times (IC_{nom;\,t-1} + PPEAdj_t + AccDepr_{t-1})] \quad (7.9)$$

Based on these definitions, CVA_{real} can be presented as follows:

$$CVA_{real} = CFO + Accrual + ATInt - CapChg + AcctAdj + InflAdj + CVAAdj_{real} \quad (7.10)$$

$$= EVA_{real} + CVAAdj_{real} \quad (7.11)$$

where:

$$CapChg = c^{*}_{nom} \text{ x } IC_{nom;\, t-1}$$

$$AcctAdj = AcctAdj_{op} - (c^{*}_{nom} \text{ x } AcctAdj_{c})$$

$$InflAdj = (GearAdj - COSAdj - DeprAdj) - \left[\left(\frac{Infl_{year}\left(c^{*}_{nom}+1\right)}{1+Infl_{year}} \text{ x } IC_{nom;\, t-1}\right) + \left(\frac{Infl_{year}\left(c^{*}_{nom}+1\right)}{1+Infl_{year}} \text{ x } AcctAdj_{c}\right) + \left(c^{*}_{real} \text{ x } PPEAdj\right)\right]$$

$$CVAAdj_{real} = (CVAAdj_{op} - AccAdj_{op}) - [c^{*}_{real} \text{ x } (AccDepr - AccAdj_{c})]$$

The resulting inflation-adjusted version of the measure (CVA_{real}) is evaluated using the same approach as reported in the preceding sections. The results from the relative and incremental information content tests for CVA_{real} are provided in Table 7.5 and Table 7.6.

Table 7.5: Tests of the relative information content of CVA_{real}, EVA_{real}, EVA_{nom}, residual income, earnings and operating cash flow

Relative information content												
Rank order of R^2	**Observations**	(1)		(2)		(3)		(4)		(5)		(6)
Panel A:	**Coefficient of positive and negative values of each performance measure constrained to be equal [a]**											
All firms	**2645**	**EBEI**	>	**CFO**	>	**RI**	>	**EVA_{nom}**	>	**CVA_{real}**	>	**EVA_{real}**
Adj. R^2		0.1016		0.0444		0.0394		0.0253		0.0127		0.0116
Panel B:	**Coefficient of positive and negative values of each performance measure allowed to differ [b]**											
All firms	**2645**	**EBEI**	>	**RI**	>	**CFO**	>	**EVA_{nom}**	>	**CVA_{real}**	>	**EVA_{real}**
Adj. R^2		0.1538		0.1234		0.0842		0.0733		0.0675		0.0618

Notes:

[a] In Panel A, the regression based on the following equation is conducted, where: $D_t = f_0 + f_1 X_t / MVE_{t-1} + f_2 X_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the six measures CFO, EBEI, RI, EVA_{nom}, EVA_{real} and CVA_{real}, and MVE is the market value of the equity three months after the beginning of the financial year.

[b] In Panel B, the regression used in Panel A is adjusted to allow different coefficients for positive and negative values of the independent variable: $D_t = g_0 + g_1 X_{t;pos} / MVE_{t-1} + g_2 X_{t;neg} / MVE_{t-1} + g_3 X_{t-1;pos} / MVE_{t-1} + g_4 X_{t-1;neg} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the six measures CFO, EBEI, RI, EVA_{nom}, EVA_{real} and CVA_{real}, and MVE is the market value of the equity three months after the beginning of the financial year.

The rankings of the adjusted R^2 values provided in Table 7.5 exhibit more or less the same patterns reported in Chapter 5 and Chapter 6. EBEI outperforms the other measures and is followed by RI and CFO. The two inflation-adjusted measures EVA_{real} and CVA_{real} did not outperform the other measures, and yield the lowest adjusted R^2 values.

Table 7.6: Tests of incremental information content of CVA_{real} components: CFO, operating accruals, after-tax interest, capital charge, accounting adjustments, inflation adjustments and cash value added adjustments

	Regression coefficient [a]	***t*-stat**	***F*-stat**	***p*-value** [b]
Observations	2645			
Constant	0.099	6.39***		
CFO_t	0.228	7.03***	35.53	<0.0001
CFO_{t-1}	0.065	2.06**		
$Accrual_t$	0.165	5.27***	21.96	<0.0001
$Accrual_{t-1}$	0.065	2.13**		
$ATInt_t$	0.899	4.50***	10.23	<0.0001
$ATInt_{t-1}$	-0.688	-3.53***		
$CapChg_t$	0.445	7.84***	48.05	<0.0001
$CapChg_{t-1}$	-0.565	-9.80***		
$AccAdj_t$	-0.778	-1.31	2.06	0.128
$AccAdj_{t-1}$	-0.074	-1.28		
$InflAdj_t$	-0.163	-2.82**	3.99	0.0187
$InflAdj_{t-1}$	-0.11	1.89*		
$CVAAdj_t$	0.675	4.22***	21.13	<0.0001
$CVAAdj_{t-1}$	-1.022	-6.48***		

Notes:

[a] The regression based on the following equation is conducted: $MktAdjRet_t = h_0 + h_1 \text{ CFO}_t / \text{MVE}_{t-1} + h_2 \text{ CFO}_{t-1} / \text{MVE}_{t-1} + h_3 \text{ Accrual}_t / \text{MVE}_{t-1} + h_4 \text{ Accrual}_{t-1} / \text{MVE}_{t-1} + h_5 \text{ ATInt}_t / \text{MVE}_{t-1} + h_6 \text{ ATInt}_{t-1} / \text{MVE}_{t-1} + h_7 \text{ CapChg}_t / \text{MVE}_{t-1} + h_8 \text{ CapChg}_{t-1} / \text{MVE}_{t-1} + h_9 \text{ AcctAdj}_t / \text{MVE}_{t-1} + h_{10} \text{ AcctAdj}_{t-1} / \text{MVE}_{t-1} + h_{11} \text{ InflAdj}_t / \text{MVE}_{t-1} + h_{12} \text{ InflAdj}_{t-1} / \text{MVE}_{t-1} + h_{13} \text{ CVAAdj}_t / \text{MVE}_{t-1} + h_{14} \text{ CVAAdj}_{t-1} / \text{MVE}_{t-1} + e_t$. D_t is the market-adjusted return for period *t*, while the independent variables are the CVA_{real} components (CFO, accruals, after-tax finance cost, capital charge, accounting adjustments, inflation adjustments and cash value added adjustments). MVE is the market value of equity three months after the start of the financial year.

[b] *p*-values in parentheses represent non-directional *F*-test of the null hypothesis of no incremental information content (Hypothesis H_{INC})

[***] Significant at the 1% level

[**] Significant at the 5% level

[*] Significant at the 10% level

The adjusted R^2 value for this regression amounts to 0.1995. This value is slightly higher than the adjusted R^2 value of 0.1880 reported for the regression based on the CVA_{nom} components. In terms of the results from the incremental information content tests the RI components CFO, Accruals, ATInt and CapChg once again provide statistically significant additional information. The information content contribution of the accounting adjustments required to calculate EVA_{nom}, however, is not statistically significant. The inflation (InflAdj) and real cash value added adjustments ($\text{CVAAdj}_{\text{real}}$) are significant at the 0.05 and 0.01 level respectively. Similar to the results obtained for EVA_{real} in the previous chapter, however, the economic significance of the inflation and cash value added adjustments required to calculate CVA_{real} are low, since the combined measure (CVA_{real}) does not manage to outperform earnings (EBEI).

7.8 SUMMARY

In this chapter, the information content of the measure CVA was compared to that of the measures EVA, RI, EBEI and CFO to determine whether CVA is able to outperform the other measures in explaining market adjusted share returns. An approach similar to Biddle *et al*. (1997: 320) was applied to a sample of South African industrial firms to evaluate the relative information content of the individual measures, as well as the incremental information content of the CVA components.

The results of the relative information content tests indicate that CVA_{nom} does not outperform earnings (EBEI) in explaining the variation in the market adjusted return of a firm's shares. CVA is also not able to outperform another less complex value based measure (RI) in all the relative information content tests. Based on the results of the relative information content tests, it appears that the additional, relatively complex adjustments required to calculate CVA_{nom} do not add significant information content beyond that already contained in RI.

The incremental information content tests indicate that the CVA_{nom} components do add significant additional information content beyond that contained in RI. The level of significance, however, for the accounting and cash value added adjustments is lower than for the RI components. Although the contributions of the individual components are significant, the information content of the combined measure is still lower than the measure earnings (EBEI). According to Biddle *et al*. (1997) these components are statistically significant on their own, but not economically significant when combined. Based on the results of the study it would appear that CVA_{nom} does not outperform the other financial performance measures.

An inflation-adjusted version of the measure (CVA_{real}) is also calculated by including the inflation adjustments recommended by IAS15. CVA_{real} is evaluated by applying the same techniques as before. The results from the relative and incremental information content tests conducted for CVA_{real} provide similar results as for the nominal version of the measure. Once again, accounting earnings (EBEI) contains the highest relative information content, followed by the other measures investigated.

In Chapter 5 and Chapter 6, the measures EVA_{nom} and EVA_{real} were evaluated respectively. Neither of these versions of EVA managed to surpass accounting earnings (EBEI) in explaining the variation in a firm's market adjusted share returns. Based on the results reported in this chapter, claims that the value based measures are able to outperform the traditional measures can once again not be supported. In the next chapter, the information content of another value based financial performance measure, namely cash flow return on investment (CFROI), will be evaluated.

Chapter 8

CASH FLOW RETURN ON INVESTMENT

8.1 INTRODUCTION

In the previous chapter the information content of the measure CVA was evaluated. The results from the relative information content test indicate that CVA is not able to outperform EBEI in explaining variations in share returns. Furthermore, the incremental information content tests indicate that although the components of CVA contain incremental information content beyond that contained in EBEI and RI, the economic significance of including these components is low.

Firms focused on the maximisation of shareholder value need to ensure that all activities yield positive net present values. A number of value based financial performance measures have been developed in an attempt to guide management actions towards achieving this objective. These value based measures attempt to include the firm's cost of capital and to adjust financial statement information in order to remove some of the accounting distortions. Performance exceeding the cost of capital yields value, while the failure to achieve this results in the destruction of shareholder value.

The measure cash flow return on investment (CFROI) has been presented as an improvement over some of the other value based measures by its proponents (Dzamba, 2003: 10). It is calculated by considering the inflation-adjusted investment in assets, the inflation-adjusted cash flow generated by employing these assets in the firm, and determines the yield generated over the estimated lifetime of the assets. If a firm is able to generate CFROI values in excess of its inflation-adjusted cost of capital it should increase its shareholders' value while CFROI values below the real cost of capital will result in the destruction of shareholders' value. So far relatively little

independent research has been conducted to investigate long-term CFROI trends for South African firms.

The objective of this chapter is to evaluate the information content of the measure CFROI. The relative and incremental information content of the measure is investigated in order to determine whether it is able to outperform other traditional and value based financial performance measures in explaining the variation in a firm's market adjusted share returns. Before this can be done, however, important assumptions of this measure have to be investigated for the South African context. The most important single determinant of a firm's CFROI level is its fade rate. Consequently, this is also analysed in some detail in this chapter.

The remainder of the chapter consists of eight sections. The first three sections focus on the calculation of CFROI, while the five sections that follow investigate the information content of the measure. The first section provides a brief discussion of the data included in the calculation of the measure. The second section contains the descriptive statistics of the measure CFROI, while the third section considers the CFROI fade characteristics. The fourth section focuses on the breakdown of the measure into its contributing components that is required for the information content tests. The fifth section contains the descriptive statistics of the measures and components included in the relative and incremental information content tests. The sixth section provides the results from the relative information content tests, while the seventh section reports on the incremental information content tests. The final section contains the summary and the conclusions.

8.2 DATA

The measures CFO, EBEI, RI, EVA_{nom}, EVA_{real}, CVA_{real} and CFROI, as well as their contributing components, are calculated for all firms listed in the industrial sector of the JSE during the 15-year period from 1991 to 2005. The calculations of these measures are discussed in greater detail in Chapter 4 and Appendices 2, 3 and 4.

Following Biddle *et al.* (1997: 311), those observations in excess of eight standard deviations from the median are classified as extreme outliers, and consequently 41 observations were removed from the sample. Both the dependent and independent variables are also winsorised to ± four standard deviations from the median. The final sample investigated in the information content tests conducted in this chapter consists of 316 firms with 2 837 complete observations. The reason why the sample investigated in this chapter is slightly smaller than the previous samples lies in the fact that additional information is required to calculate CFROI values. This information is not available for all the firms evaluated in the previous chapters.

8.3 DESCRIPTIVE STATISTICS

The descriptive statistics for CFROI, nominal cost of capital (c^*_{nom}) and real cost of capital (c^*_{real}) calculated for the sample of industrial firms over the 15-year period 1991 to 2005 are provided in Table 8.1:

Table 8.1: Descriptive statistics of CFROI, c^*_{real} and c^*_{nom} for the full period

	MEAN	MEDIAN	STANDARD DEVIATION
CFROI	6.36	6.66	18.78
c^*_{real}	6.50	6.61	5.67
c^*_{nom}	13.93	13.95	5.29

When evaluating a firm's CFROI value, it is necessary to compare it to the real cost of capital. The real cost of capital is calculated by adjusting the nominal cost of capital with the change in the PPI during the firm's financial year. In Chapter 4 the calculation of the real cost of capital was defined as follows:

$$c^*_{real} = \left(\frac{1 + c^*_{nom}}{1 + Infl_{year}} \right) - 1$$

where:

c^*_{real} = the real cost of capital

c^*_{nom} = the nominal cost of capital

$Infl_{year}$ = the change in the PPI during the financial year

The mean CFROI value calculated over the 15-year period 1991 to 2005 amounts to 6.36%. This value is close to the long-term mean value of 6% for USA firms reported by Madden (1999: 22). The standard deviation of the CFROI values is relatively high (18.78), and indicates a high level of variation in the values of the measure. CFROI is calculated in a similar way as an IRR, and the variation in the values could possibly be ascribed to this. Other factors contributing to the variability in the value of the measure could be unstable estimates of the asset lifetime, as well as the inflation-adjusted gross cash flows. The remaining asset lifetime is estimated by considering the accumulated depreciation and carrying values of the PPE, and does not represent the actual lifetime of the assets. Furthermore, if a firm experienced unexpected declines in its profit figures for a specific year, this will have a large negative influence on its CFROI value for that year.

Both the mean and median CFROI values calculated for the pooled data are close to the c^*_{real} values. This could be interpreted as an indication that most firms struggle to realise returns in excess of their real cost of capital. As indicated by Biddle *et al.* (1997: 313), this is the case in most competitive economies.

In order to investigate changes in the value of CFROI during the period investigated in this study the annual mean and median CFROI values are plotted in Figure 8.1.

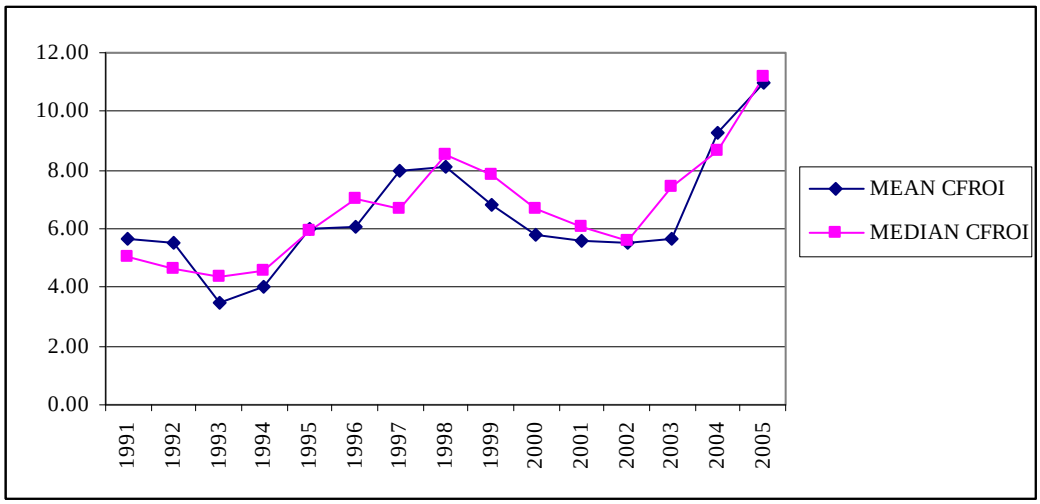


Figure 8.1: Mean and median CFROI values for the years 1991 to 2005

From Figure 8.1 it could be seen that the majority of the mean and median values of CFROI vary around the 15-year mean value of 6.36% calculated for the full period data. Relatively large increases in the values, however, are observed for the period 2002 to 2005 where the mean CFROI value increases from a level of 5.50% to 10.98%. This change corresponds to a period of high overall growth in the South African economy. Similar increases were also observed for the other value based measures investigated in the previous chapters.

To evaluate the value creating potential of a firm it is necessary to compare its CFROI value to its c^*_{real}. In Figure 8.2 the mean values calculated for CFROI, c^*_{real}, as well as the spread between the two measures (CFROI minus c^*_{real}) are provided graphically.

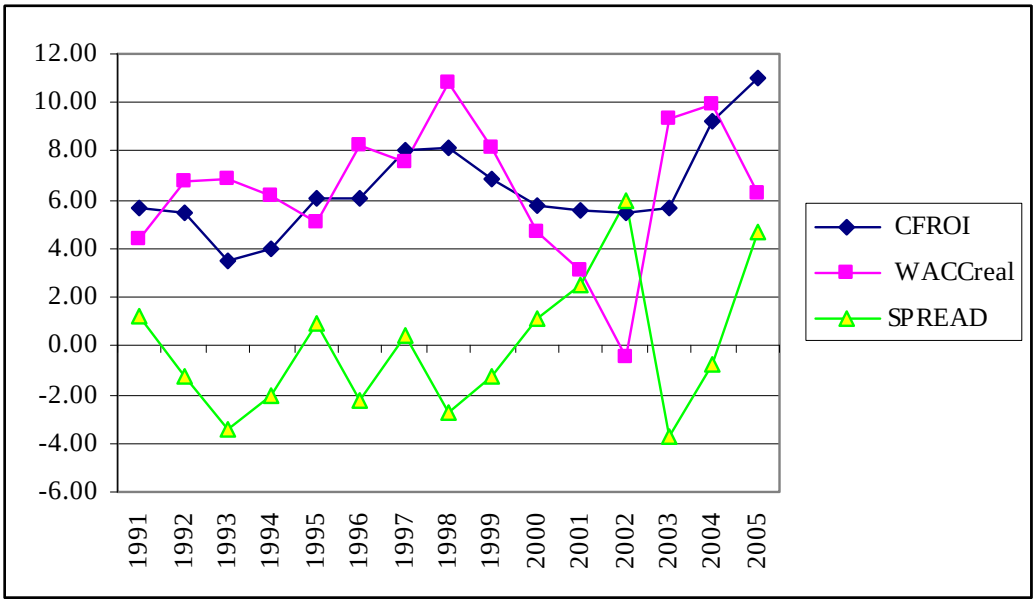


Figure 8.2: Mean values for CFROI, c^*_{real}, and the spread between the two measures

The spread between the two measures is calculated as the difference between CFROI and c^*_{real}. A positive value indicates CFROI values in excess of the c^*_{real}, while a negative value signifies the opposite. During the 15-year period observed in this study the split between positive and negative spreads is almost equal, with seven positive and eight negative occurrences. For the majority of years investigated, the spread value varies between -4% and +4%. The most pronounced deviation from this trend occurs during 2002 and may be ascribed to a low c^*_{real} value for the year. This low c^*_{real} value, in turn, is the result of a sharp increase in the PPI during that particular year.

In order to investigate the changes in CFROI levels over time the pooled data were ranked according to firms' CFROI values for the financial year 1991 and divided into four quartiles. Quartile one (Q1) contains those firms with the lowest CFROI values

in 1991, while quartile four (Q4) contains the firms with the highest CFROI values. Figure 8.3 contains the mean values of these quartiles over the 15-year period investigated in this study.

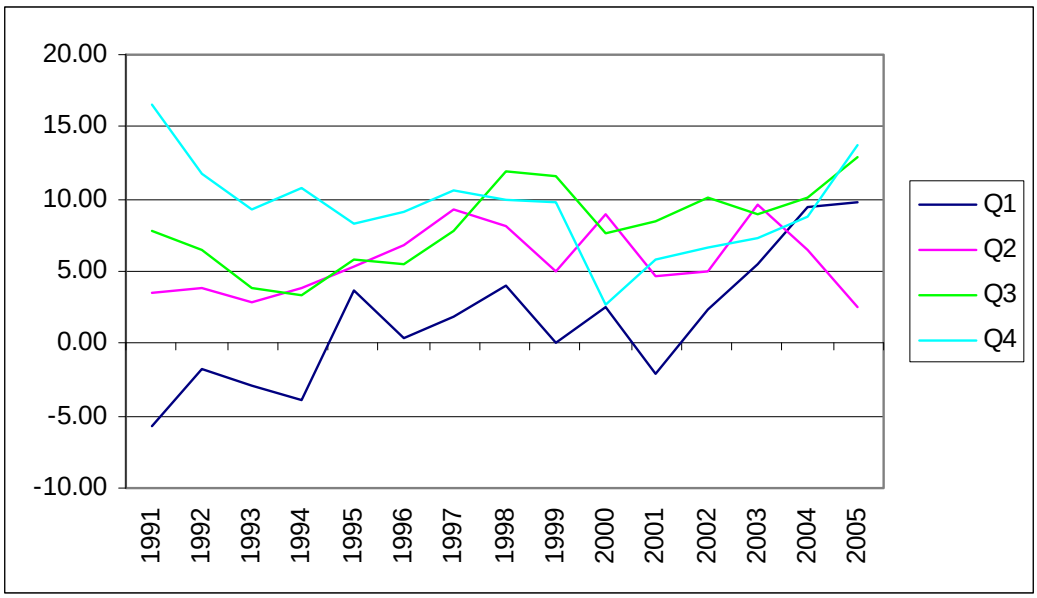


Figure 8.3: Mean CFROI values for the four quartiles

The mean CFROI value for Q1 increased from -5.65% in 1991 to 9.72% in 2005 while it decreased from 16.54% to 13.80% for Q4. Based on a perusal of Figure 8.3 it appears that the CFROI values move towards the long-term mean value over time. Firms with high CFROI values experience a decrease in their values, while lower CFROI firms increase their values over time.

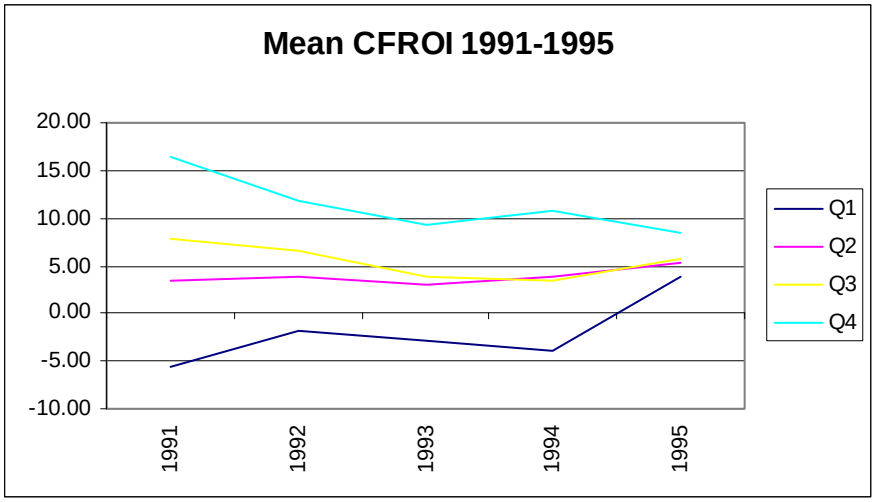
According to Madden (1996: 15) a shorter time frame (four to six years) is useful to investigate CFROI changes. The 15-year study period are therefore divided into the five-year sub-periods 1991 to 1995, 1996 to 2000, and 2001 to 2005. Descriptive statistics for these sub-periods are provided in Table 8.2.

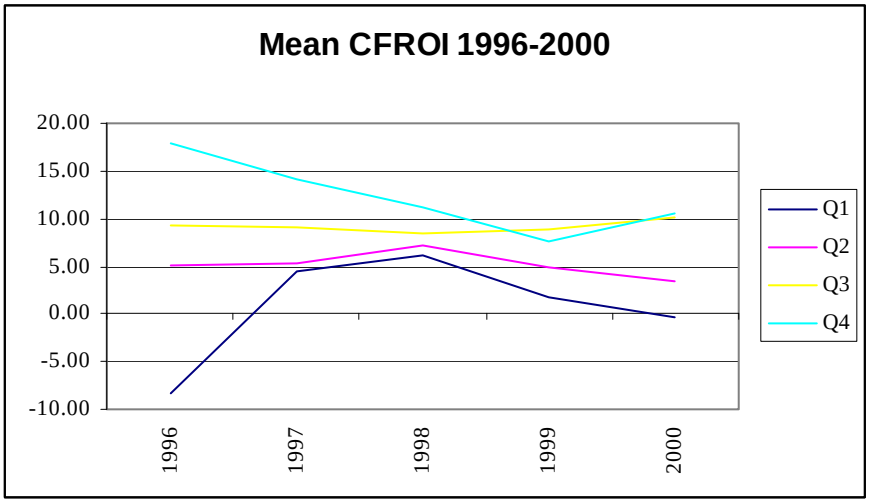
Table 8.2: Descriptive statistics of CFROI, c^*_{real} and c^*_{nom} for the three five-year sub-periods

	MEAN				MEDIAN				STANDARD DEVIATION		
PERIODS	**1991-1996**	**1997-2000**	**2001-2005**		**1991-1996**	**1997-2000**	**2001-2005**		**1991-1996**	**1997-2000**	**2001-2005**
CFROI	4.95	6.97	7.24		4.97	7.39	7.63		12.48	19.38	24.22
c^*_{real}	5.85	7.88	5.40		6.09	8.15	5.21		4.34	5.34	6.70
c^*_{nom}	15.22	14.90	11.56		15.30	14.90	11.30		4.36	5.08	5.53

If the mean and median CFROI values for the three sub-periods are considered, it can be seen that the values of the measure increase during the period investigated. The mean and median c^*_{real} values also increase during the second sub-period, but then decrease during the final sub-period. The standard deviations calculated for both the CFROI and c^*_{real} values increase during the three sub-periods.

Madden (1996: 10) refers to the rate of these changes in CFROI values as a "fade rate", which is the rate at which outlying CFROI values migrate towards the firm's cost of capital over time. In order to investigate these changes in the CFROI values, Figure 8.4 provides a graphic representation of the mean CFROI fade patterns compiled for the three five-year sub-periods.





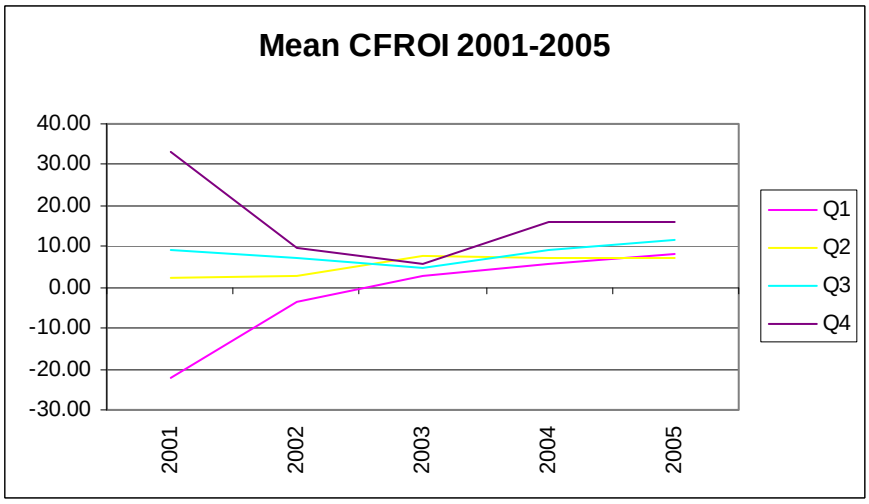


Figure 8.4: CFROI fade patterns for the periods 1991 to 1995, 1996 to 2000 and 2001 to 2005

In Figure 8.4 a similar trend is observed for each one of the three sub-periods. The lowest CFROI quartiles (Q1) all exhibit increasing mean values, while the highest CFROI quartiles (Q4) all yield declining mean values.

From the figures above it becomes clear that over time, high and low CFROI values tend to converge towards an average level. For a firm to remain competitive, it is consequently not sufficient to merely continue with its current operations, since this strategy would ultimately result in the destruction of shareholder value. By obtaining a better understanding of those factors influencing the fade rate, management could be able to determine how they can reduce their firm's level of CFROI fade and increase shareholder value. Before the information contents of CFROI and its contributing components are investigated, the focus is thus placed on those factors influencing the CFROI fade rate.

In order to investigate the CFROI fade rate, the next section of this chapter, therefore, focuses on those factors that contribute towards the CFROI fade. An analysis similar to the one conducted by Madden (1996) is performed.

8.4 CFROI FADE CHARACTERISTICS

According to Madden (1996: 15) a firm's CFROI fade rate is influenced by three variables. The firm's level of CFROI, the variation in levels of CFROI and its growth rate all influence the extent of its CFROI fade. In order to investigate the influence of these factors on a firm's CFROI fade rate, the following fade class construction is applied (Madden, 1996: 15):

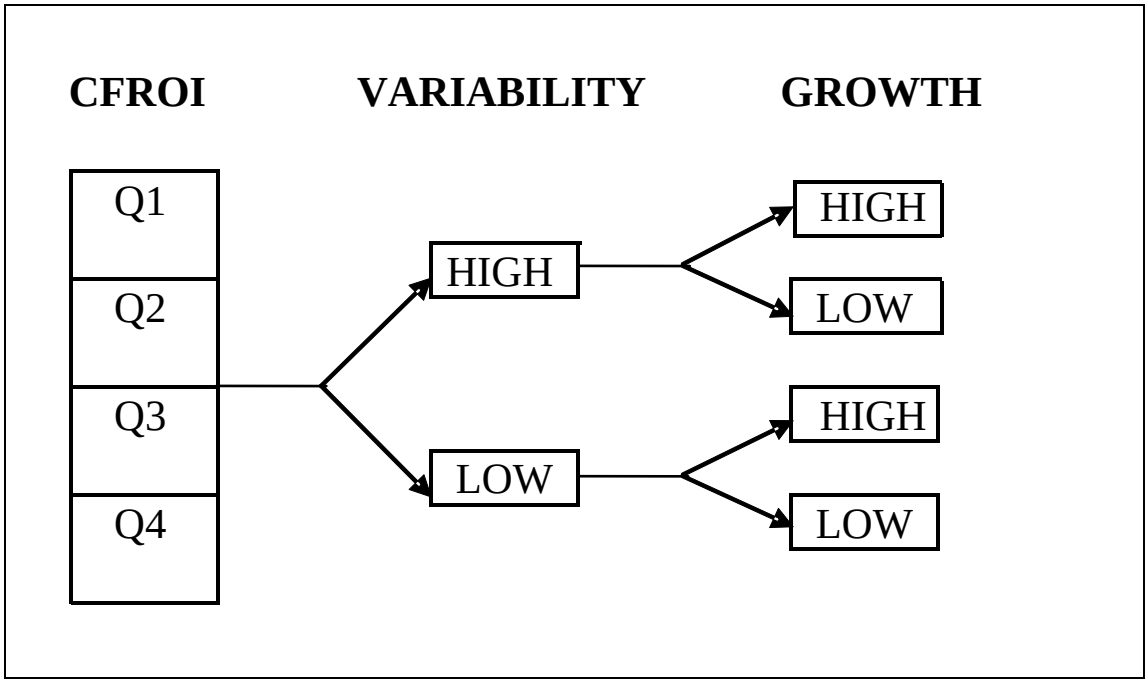


Figure 8.5: CFROI fade class construction

The level of a firm's managerial skill is represented by its level of CFROI (represented by the ranked CFROI values divided into quartiles Q1 to Q4), and the variation of its CFROI values (the variability, as measured by the standard deviation in CFROI levels). A higher CFROI value combined with lower variation could be interpreted as an indication of a higher degree of management skill. A firm's growth rate also influences changes in CFROI levels. Madden (1996: 15) estimates a firm's growth by considering the portion of earnings not paid out as dividends, but rather reinvested in the firm. Firms with high CFROI levels combined with high growth rates are usually exposed to higher levels of competition. This in turn results in downward pressure on its CFROI levels. Hence these three factors are included in the fade classes represented in Figure 8.5.

In order to evaluate the changes in CFROI levels the median CFROI values for a five-year period are calculated and compared to the median values for the subsequent five-year period. Based on the 15-year period included in this study it results in the analysis conducted at two points in time (*t*): 1995 and 2000. The following variables are included in the analysis:

$CFROI_{past}$	=	a firm's median CFROI value for the financial years *t* to *t*-4
$CFROI_{future}$	=	a firm's median CFROI value for the financial years *t*+1 to *t*+5
VARIABILITY	=	the standard deviation of a firm's CFROI values for the financial years *t* to *t*-4
B	=	$\frac{\text{Earnings - Ordinary Dividends}}{\text{Earnings}}$
GROWTH	=	the median of B for the financial years *t* to *t*-4

Firms are ranked according to their $CFROI_{past}$ values and divided into four quartiles. The first of these quartiles, Q1, contains those firms with the highest $CFROI_{past}$ values, while Q4 contains the lowest $CFROI_{past}$ values. Within these quartiles firms are then also ranked based on their variability (high or low) and growth (high or low). For each of the resulting fade classes the median difference between $CFROI_{past}$ and $CFROI_{future}$ is calculated. The results from this analysis are provided in Table 8.3.

Table 8.3: Changes in median CFROI values for the different fade classes

		GROWTH		
CFROI	**VARIABILITY**	**HIGH**	**LOW**	**ALL**
Q1	**HIGH**	-12.40	-2.55	-4.83
Q1	**LOW**	-7.03	-0.76	-3.57
Q1	**ALL**	-7.27	-1.28	-3.84
Q2	**HIGH**	1.28	-2.51	-1.95
Q2	**LOW**	-1.67	0.89	-0.88
Q2	**ALL**	-1.65	-0.37	-0.97
Q3	**HIGH**	3.43	2.61	2.82
Q3	**LOW**	2.39	2.22	1.76
Q3	**ALL**	2.32	2.00	2.27
Q4	**HIGH**	11.68	4.60	5.52
Q4	**LOW**	1.18	3.34	2.27
Q4	**ALL**	5.24	2.67	3.09
ALL	**HIGH**	1.76	0.07	0.47
ALL	**LOW**	-0.74	1.16	0.26
ALL	**ALL**	0.33	0.32	0.33

From Table 8.3 it may be seen that the highest decreases (and increases) in the median CFROI values occur for Q1 (and Q4) respectively. The largest increase (11.68%) in the median CFROI values is observed for high growth, high variability firms located in Q4. In contrast to this the high growth, high variability firms located in Q1 experienced a decrease of 12.4% in their median CFROI values. The median CFROI values for the four quartiles overall differ from a 3.09% increase (Q4) to a 3.84% decrease (Q1).

For Q3 and Q4 the greatest gains were realised for those firms with high variability levels. The opposite is observed for Q1 and Q2 where the high variability firms

exhibit the largest decreases in median CFROI values. Those fade classes that contain the low variability firms exhibit lower levels of change in median CFROI values. A similar trend is observed for the high growth firms (with the exception of Q2). High growth firms generate larger increases in median CFROI values than low growth firms for Q2, Q3 and Q4, while the opposite is observed for Q1.

The implications of these results are especially important for the management of those firms located in Q1 and Q4. The results indicate that those firms listed in Q1 with high growth rates and high CFROI variability experience higher levels of CFROI fade than any of the other fade classes. The managers of these firms need to recognise that they will be faced with increasing levels of competition that could ultimately have a negative effect on their financial performance.

Conversely, the high growth, high variability firms located in Q4 experienced larger increases in CFROI values than any other fade class. Firms located in these quartiles generate unsatisfactory returns and management need to implement drastic measures in order to ensure that this is corrected. Failure to do so could result in the acquisition by another firm or even financial failure.

8.5 THE COMPONENTS OF CFROI

When CFROI is applied to evaluate a firm's shareholder value creation, it is usually compared to the inflation-adjusted cost of capital. The difference between a firm's CFROI and its real cost of capital (c^*_{real}) is, therefore, calculated when the information content tests are conducted. This difference ($CFROI_{Margin}$) between the two values measures the CFROI margin earned over (or below) the firm's inflation-adjusted cost of capital.

In order to investigate the relative and incremental information content of this $CFROI_{Margin}$ and the measures operating cash flow (CFO), earnings before extraordinary items (EBEI), residual income (RI), nominal and inflation-adjusted economic value added (EVA_{nom} and EVA_{real}) and inflation-adjusted cash value added

(CVA_{real}), the $CFROI_{Margin}$ is partitioned into its contributing components using the approach applied by Biddle *et al*. (1997: 305). According to this approach, $CFROI_{Margin}$ may be presented as follows (Biddle *et al*., 1997: 307):

$$CFROI_{Margin} = CFO + Accrual + ATInt - CapChg + AcctAdj + InflAdj + CVAAdjreal + CFROIAdj \quad (8.1)$$

where:

Accrual	=	The total operating accruals of the firm
ATInt	=	Interest expense after provision for tax
CapChg	=	The capital charge based on the cost of capital and the invested capital at the beginning of the financial year
AcctAdj	=	The accounting adjustments to NOPAT and IC_{t-1} to calculate EVA_{nom}
InflAdj	=	The IAS15 inflation adjustments included to calculate EVA_{real}
CVAAdjreal	=	The adjustments made to EVA_{real} to calculate CVA_{real}
CFROIAdj	=	The difference between CVA_{real} and the firm's $CFROI_{Margin}$

The relationship between the $CFROI_{Margin}$ components is summarised in Figure 8.6 (Biddle *et al*., 1997: 307):

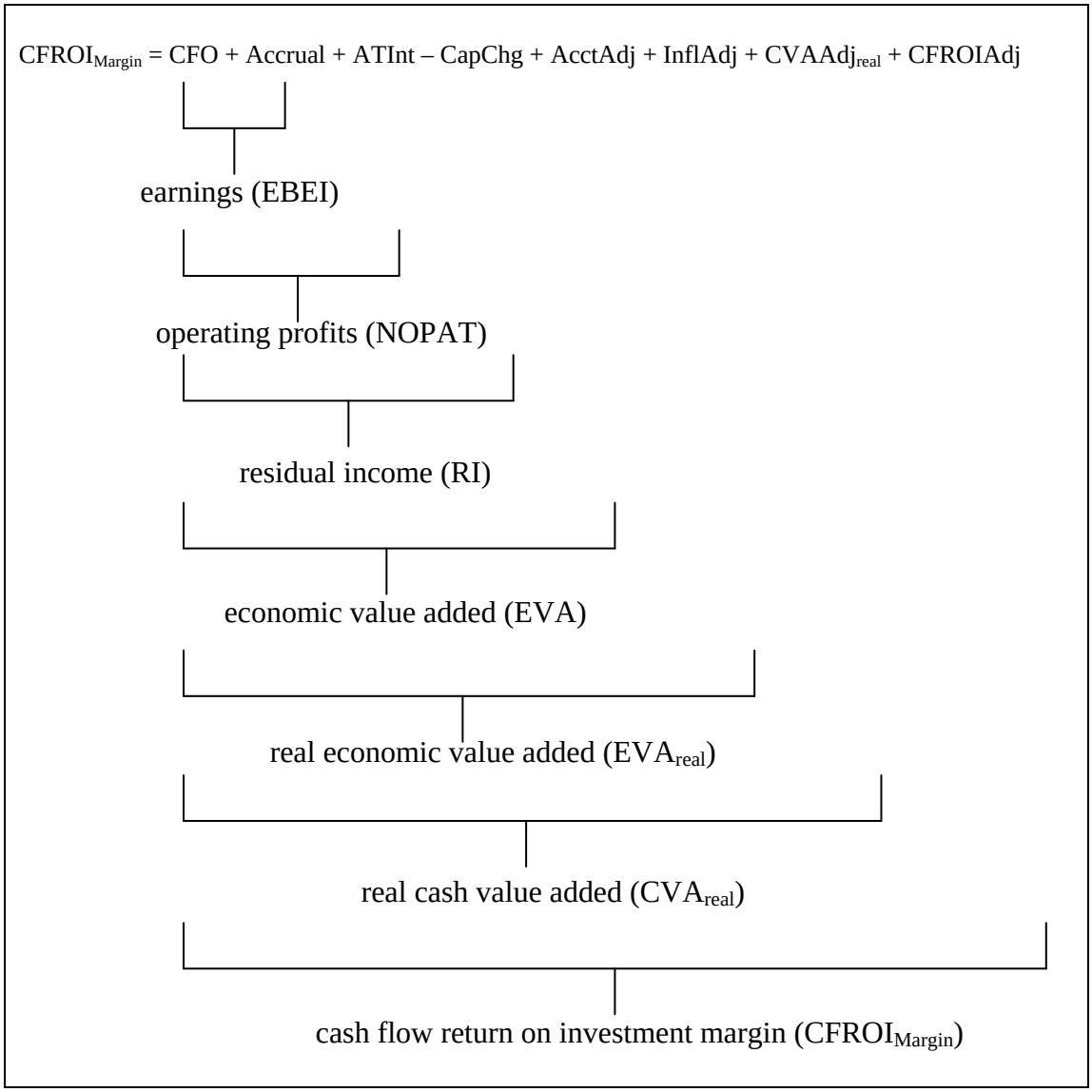


Figure 8.6: Components of the cash flow return on investment margin (CFROI$_{Margin}$)

8.6 DESCRIPTIVE STATISTICS OF THE MEASURES AND COMPONENTS INCLUDED IN THE INFORMATION CONTENT TESTS

8.6.1 MEASURES INCLUDED IN THE RELATIVE INFORMATION CONTENT TESTS

The descriptive statistics of the winsorised values of *MktAdjRet*, EBEI, CFO, RI, EVA_{nom}, EVA_{real}, CVA_{real} and $CFROI_{Margin}$ included in the relative information content tests pooled across time are provided in Table 8.4.

Table 8.4: Descriptive statistics on the dependent and independent variables in the relative information content tests of $CFROI_{Margin}$

	Descriptive statistics							
	Dependent Variable	**Independent Variables**						
	MktAdjRet	**EBEI**	**CFO**	**RI**	**EVA_{nom}**	**EVA_{real}**	**CVA_{real}**	**$CFROI_{Margin}$**
Mean	0.141	0.202	0.297	-0.089	-0.142	-0.135	-0.039	-0.007
Median	0.018	0.125	0.151	0.003	-0.019	-0.007	0.022	-0.002
Std. Dev.	0.761	0.508	0.647	0.495	0.532	0.687	0.698	0.155
	Correlations							
	Dependent Variable	**Independent Variables**						
	MktAdjRet	**EBEI**	**CFO**	**RI**	**EVA_{nom}**	**EVA_{real}**	**CVA_{real}**	**$CFROI_{Margin}$**
MktAdjRet	1.000							
EBEI	0.297	1.000						
CFO	0.165	0.491	1.000					
RI	0.161	0.374	0.018	1.000				
EVA_{nom}	0.118	0.261	-0.037	0.909	1.000			
EVA_{real}	0.095	0.229	-0.065	0.747	0.833	1.000		
CVA_{real}	0.121	0.314	0.069	0.687	0.748	0.954	1.000	
$CFROI_{Margin}$	0.186	0.280	0.056	0.418	0.342	0.323	0.317	1.000

Notes:

All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are size-adjusted by divided them by the market value of the equity as measured three months after the beginning of the financial year. All correlations are significant at the 1% level, except between CFO, and RI and EVA_{nom}.

The measures EBEI and CFO once again exhibit the highest mean and median values, while the value based measures display small mean and median values, which are all close to zero. The lowest mean and median values are observed for the measure $CFROI_{Margin}$.

If the correlations are considered, all are found to be statistically significant at the 1% level, except the correlations between CFO, and RI and EVA_{nom}. The highest correlation between the dependent variable and an independent variable is observed between *MktAdjRet* and EBEI. In the case of $CFROI_{Margin}$, the highest correlation is between the measure and RI (correlation coefficient of 0.418). It is also interesting to note that the correlation between *MktAdjRet* and $CFROI_{Margin}$ is the highest for all the value based measures.

8.6.2 COMPONENTS INCLUDED IN THE INCREMENTAL INFORMATION CONTENT TESTS

The descriptive data of the winsorised $CFROI_{Margin}$ components included in the incremental information content tests pooled across time are provided in Table 8.5:

Table 8.5: Descriptive statistics on the dependent and independent variables in the incremental information content tests of the $CFROI_{Margin}$ components

	Descriptive statistics								
	Dependent Variable	**Independent Variables**							
	MktAdjRet	**CFO**	**Accruals**	**ATInt**	**CapChg**	**AccAdj**	**InflAdj**	**$CVAAdj_{real}$**	**CFROIAdj**
Mean	0.141	0.297	-0.069	0.086	0.378	-0.053	0.009	0.096	0.031
Median	0.018	0.151	-0.022	0.029	0.169	-0.017	0.008	0.038	-0.017
Std. Dev.	0.761	0.647	0.589	0.175	0.650	0.215	0.346	0.195	0.667
	Correlations								
	Dependent Variable	**Independent Variables**							
	MktAdjRet	**CFO**	**Accruals**	**ATInt**	**CapChg**	**AccAdj**	**InflAdj**	**$CVAAdj_{real}$**	**CFROIAdj**
MktAdjRet	1.000								
CFO	0.165***	1.000							
Accruals	0.054***	-0.505***	1.000						
ATInt	0.094***	0.224***	-0.088***	1.000					
CapChg	0.139***	0.441***	-0.035*	0.622***	1.000				
AccAdj	-0.068***	-0.117***	-0.008	-0.263***	-0.228***	1.000			
InflAdj	0.004	-0.078***	0.052***	0.208***	0.051***	0.040**	1.000		
$CVAAdj_{real}$	0.112***	0.446***	-0.089***	0.561***	0.518***	-0.181***	0.264***	1.000	
CFROIAdj	-0.082***	-0.058***	-0.165***	0.012	0.282***	-0.337***	-0.617***	-0.259***	1.000

Notes:
All the variables are winsorised at ± four standard deviations from the median values. All the independent variables are deflated by the market value of the equity as measured three months after the beginning of the financial year.

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

The correlations between the majority of the $CFROI_{Margin}$ components are statistically significant at the 1% level. The correlation between AccAdj and InflAdj is significant at the 5% level, while the correlation between CapChg and Accruals is significant at the 10% level. Only the correlations between *MktAdjRet* and InflAdj, AccAdj and Accruals, and CFROIAdj and ATInt are not significant.

8.7 RELATIVE INFORMATION CONTENT TESTS OF $CFROI_{Margin}$

The relative information content of the measures included in this chapter is evaluated by comparing the adjusted R^2 values obtained from seven separate regressions based on the following equation:

$$D_t = b_0 + b_1 X_t / MVE_{t-1} + b_2 X_{t-1} / MVE_{t-1} + e_t. \quad (8.2)$$

where:

D_t = the market-adjusted return for period t.
X = one of the seven measures CFO, EBEI, RI, EVA_{nom}, EVA_{real}, CVA_{real} and $CFROI_{Margin}$.
MVE_{t-1} = the market value of the equity three months after the beginning of the financial year.

The results from the relative information content tests are provided in Table 8.6:

Table 8.6: Tests of the relative information content of $CFROI_{Margin}$, CVA_{real}, EVA_{real}, EVA_{nom}, residual income, earnings and operating cash flow

Relative information content													
Rank order of R^2	**Observations**	**(1)**		**(2)**		**(3)**		**(4)**		**(5)**		**(6)**		**(7)**
Panel A:	**Coefficient of the positive and negative values of each performance measure constrained to be equal [a]**													
All firms	**2450**	**EBEI**	**>**	**$CFROI_{Margin}$**	**>**	**RI**	**>**	**CFO**	**>**	**EVA_{nom}**	**>**	**EVA_{real}**	**>**	**CVA_{real}**
Adj. R^2		0.0773		0.0430		0.0375		0.0319		0.0305		0.0139		0.0138
Panel B:	**Coefficient of positive and negative values of each performance measure allowed to differ [b]**													
All firms	**2450**	**RI**	**>**	**EBEI**	**>**	**EVA_{nom}**	**>**	**EVA_{real}**	**>**	**CVA_{real}**	**>**	**CFO**	**>**	**$CFROI_{Margin}$**
Adj. R^2		0.1126		0.0886		0.0855		0.0635		0.0597		0.0472		0.0429

Notes:

[a] In Panel A, the regression based on Equation (8.2) is conducted, where: $D_t = b_0 + b_1 X_t / MVE_{t-1} + b_2 X_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the seven measures CFO, EBEI, RI, EVA_{nom}, EVA_{real}, CVA_{real} and $CFROI_{Margin}$, and MVE is the market value of the equity three months after the beginning of the financial year.

[b] In Panel B, the regression used in Panel A is adjusted to allow different coefficients for positive and negative values of the independent variable: The regression based on the following equation is conducted, where: $D_t = c_0 + c_1 X_{t;pos} / MVE_{t-1} + c_2 X_{t;neg} / MVE_{t-1} + c_3 X_{t-1;pos} / MVE_{t-1} + c_4 X_{t-1;neg} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period t, X is one of the seven measures CFO, EBEI, RI, EVA_{nom}, EVA_{real}, CVA_{real} and $CFROI_{Margin}$, and MVE is the market value of the equity three months after the beginning of the financial year.

Panel A of Table 8.6 contains the adjusted R^2 values calculated for the seven separate regressions. The measures are arranged in decreasing order based on their adjusted R^2 values. EBEI has a significantly higher adjusted R^2 value (0.0773) than the other measures. The regression analysis based on the $CFROI_{Margin}$ values yields the second largest adjusted R^2 value (0.0438). It is followed by RI (0.0375), CFO (0.0319), EVA_{nom} (0.0305), EVA_{real} (0.0139) and CVA_{real} (0.0138) correspondingly. In terms of relative information content, EBEI, therefore, once again appears to outperform the other measures. In terms of the value based financial measures, $CFROI_{Margin}$ yields the best results.

The tests for relative information content are repeated again after allowing different coefficients for the positive and negative values of the different measures. The results from these regressions are provided in Panel B of Table 8.6. All the measures exhibit higher adjusted R^2 values. The measure RI experienced the largest increase in its adjusted R^2 value (0.0375 to 0.1126), and it exhibits the highest adjusted R^2 value overall when compared to the other measures. It is followed by EBEI (0.0886), EVA_{nom} (0.0855), EVA_{real} (0.0635), CVA_{real} (0.0597) and CFO (0.0472) respectively.

In the case of $CFROI_{Margin}$, however, the measure dropped from the second to the last position overall in terms of the ranking of the adjusted R^2 values. It is also the only measure where the adjusted R^2 value decreased when the distinction between positive and negative values is allowed. A possible reason for this decrease could be the variable nature of the CFROI values. The cash flows included in the calculation of a firm's CFROI values are estimated based on the firm's profit figures. Relatively small changes in the profit figures, however, could result in CFROI values switching from a positive to a negative value (and vice versa). These changes are not the result of a pronounced difference in the firm's financial performance, but rather the way in which CFROI values (and IRR measures in general) are calculated. Distinguishing between the positive and negative values of the measure therefore reduces the adjusted R^2 value of the regression analysis.

8.8 INCREMENTAL INFORMATION CONTENT TESTS OF THE $CFROI_{Margin}$ COMPONENTS

In order to evaluate the incremental information contents of the $CFROI_{Margin}$ components, the following regression analysis is conducted:

$$\begin{aligned} MktAdjRet_t = {} & d_0 + d_1\ CFO_t / MVE_{t-1} + d_2\ CFO_{t-1} / MVE_{t-1} + \\ & d_3\ Accrual_t / MVE_{t-1} + d_4\ Accrual_{t-1} / MVE_{t-1} + \\ & d_5\ ATInt_t / MVE_{t-1} + d_6\ ATInt_{t-1} / MVE_{t-1} + \\ & d_7\ CapChg_t / MVE_{t-1} + d_8\ CapChg_{t-1} / MVE_{t-1} + \\ & d_9\ AcctAdj_t / MVE_{t-1} + d_{10}\ AcctAdj_{t-1} / MVE_{t-1} + \\ & d_{11}\ InflAdj_t / MVE_{t-1} + d_{12}\ InflAdj_{t-1} / MVE_{t-1} + \\ & d_{13}\ CVAAdj_{real;\ t} / MVE_{t-1} + d_{14}\ CVAAdj_{real;\ t-1} / MVE_{t-1} + \\ & d_{15}\ CFROIAdj_t / MVE_{t-1} + d_{16}\ CFROIAdj_{t-1} / MVE_{t-1} + e_t \end{aligned} \quad (8.3)$$

The results of the incremental information content tests of the $CFROI_{Margin}$ components are provided in Table 8.7:

Table 8.7: Tests of incremental information content of $CFROI_{Margin}$ components: CFO, operating accruals, after-tax interest, capital charge, accounting adjustments, inflation adjustments, real cash value added adjustments and CFROI adjustments

	All firms [a]	***t*-stat**	***F*-stat**	***p*-value** [b]
Observations	2450			
Constant	0.060	3.35***		
CFO_t	0.218	5.12***	13.36	<0.0001
CFO_{t-1}	-0.029	-0.62		
$Accrual_t$	0.134	3.46***	5.97	0.0026
$Accrual_{t-1}$	-0.048	-1.14		
$ATInt_t$	-0.442	-2.43**	7.26	0.0007
$ATInt_{t-1}$	0.700	3.79***		
$CapChg_t$	0.186	2.68***	3.63	0.0265
$CapChg_{t-1}$	-0.101	-1.49		
$AccAdj_t$	-0.302	-3.25***	5.51	0.0041
$AccAdj_{t-1}$	0.011	0.12		
$InflAdj_t$	-0.154	-1.94*	1.99	0.1364
$InflAdj_{t-1}$	0.030	0.37		
$CVAAdj_t$	-0.471	-3.02***	4.82	0.0082
$CVAAdj_{t-1}$	0.253	1.55		
$CFROIAdj_t$	-0.208	-3.81***	7.39	0.0006
$CFROIAdj_{t-1}$	0.042	0.72		

Notes:

[a] The regression based on the following equation is conducted: $MktAdjRet_t = d_0 + d_1\ CFO_t / MVE_{t-1} + d_2\ CFO_{t-1} / MVE_{t-1} + d_3\ Accrual_t / MVE_{t-1} + d_4\ Accrual_{t-1} / MVE_{t-1} + d_5\ ATInt_t / MVE_{t-1} + d_6\ ATInt_{t-1} / MVE_{t-1} + d_7\ CapChg_t / MVE_{t-1} + d_8\ CapChg_{t-1} / MVE_{t-1} + d_9\ AcctAdj_t / MVE_{t-1} + d_{10}\ AcctAdj_{t-1} / MVE_{t-1} + d_{11}\ InflAdj_t / MVE_{t-1} + d_{12}\ InflAdj_{t-1} / MVE_{t-1} + d_{13}\ CVAAdj_t / MVE_{t-1} + d_{14}\ CVAAdj_{t-1} / MVE_{t-1} + d_{15}\ CFROIAdj_t / MVE_{t-1} + d_{16}\ CFROIAdj_{t-1} / MVE_{t-1} + e_t$. D_t is the market-adjusted return for period *t*, while the independent variables are the $CFROI_{Margin}$ components (CFO, accruals, after-tax finance cost, capital charge, accounting adjustments, inflation adjustments and cash value added adjustments). MVE is the market value of equity three months after the start of the financial year.

[b] *p*-values in parentheses represent non-directional *F*-test of the null hypothesis of no incremental information content (Hypothesis H_{INC})

[***] Significant at the 1% level

[**] Significant at the 5% level

[*] Significant at the 10% level

If the results from the incremental information content tests are considered, it is observed that the regression coefficients of all the current year's $CFROI_{Margin}$ components except InflAdj are highly significant. If the previous year's variables are considered, only the correlation coefficient of $ATInt_{t-1}$ is significant. The *F*-statistic for the component InflAdj is not statistically significant, indicating that it does not contribute significant information content. The other *F*-statistics, however, are all significant, indicating that the remaining CFROI components contain statistically significant incremental information content.

The adjusted R^2 value for the regression analysis conducted to evaluate the incremental information content of the $CFROI_{Margin}$ components, however, is much lower than the values obtained for the measures EVA_{real}, CVA_{nom} and CVA_{real} in the preceding chapters. An adjusted R^2 value of 0.0628 is observed in the case of the $CFROI_{Margin}$ components, compared to values of 0.1861, 0.1880 and 0.1995 respectively. Although the incremental information content of the $CFROI_{Margin}$ components are statistically significant, it explains less of the variation in the market adjusted share returns.

8.9 SUMMARY

The financial performance measure cash flow return on investment (CFROI) is proposed as an improvement over some of the other value based financial measures. The objective of this chapter was to evaluate the relative and incremental information content of the measure. Furthermore, it provided a brief overview of the calculation and interpretation of CFROI and evaluated trends in the value of the measure for listed South African industrial firms.

Empirical results indicate that the long-term South African mean CFROI value is 6.36%. The results also contain evidence of a reversion to the mean CFROI value with firms converging towards this long-term mean value over time. When the factors influencing the fade rate are considered it was determined that the variability in a firm's CFROI value and its growth rate play an important role. These factors are of special importance to the management of those firms with above-average CFROI values as well as for firms that generate insufficient returns.

In the second part of the chapter the information content of CFROI was investigated. In order to evaluate the shareholder value creating potential of a firm, the difference between its CFROI value and its real cost of capital ($CFROI_{Margin}$) is calculated. When the relative information content of this difference between CFROI and c^*_{real} is investigated, the results indicate that $CFROI_{Margin}$ is not able to outperform earnings (EBEI) in explaining market adjusted share returns. The results from the incremental information content tests indicate that the adjustments required in order to calculate $CFROI_{Margin}$ do contribute statistically significant incremental information content. If the adjusted R^2 value of the multiple regression analysis conducted to evaluate the incremental information content of the measure is compared to the adjusted R^2 values obtained from the incremental information content tests of the other value based measures, however, a much lower value is observed. The components of $CFROI_{Margin}$ therefore explains significantly less of the variation in market adjusted share returns than the components of the other value based measures investigated in the previous chapters.

Based on the results reported in this chapter it once again appears as if the value based measure $CFROI_{Margin}$ is not able to outperform earnings (EBEI) in explaining the variation in market adjusted share returns. The incremental information content tests conducted to evaluate the contribution of the $CFROI_{Margin}$ components also yield much lower results than for the value based measures investigated in the previous chapters.

Chapter 9

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

9.1 INTRODUCTION

Proponents of the value based financial performance measures generally report high levels of correlation with share returns, and they propose these measures as a major improvement over the traditional financial measures. Contradictory results reported in other studies raise the question whether these value based measures are able to outperform the traditional measures. The primary objective of this study is, therefore, to investigate the traditional and value based financial performance measures in an attempt to evaluate the relationships between the different measures and market adjusted share returns. For this purpose an approach, which evaluates the relative and incremental information content of the various measures, is applied to a sample of South African industrial firms during the period 1991 to 2005.

This chapter consists of four sections. The first section provides a summary of the results reported in the previous chapters of the study. The second section contains a number of conclusions based on these results. In the third section, recommendations with regard to the implications of these results are made. The final section highlights the limitations faced in the study, and possibilities for future research are identified.

9.2 SUMMARY

The primary research objectives of this study are as follows:

- To determine the relationship between the traditional financial performance measures and shareholder value creation.

- To investigate the value based measures EVA, CVA and CFROI, and to evaluate their relationship with the creation of shareholder value.

- To evaluate the incremental informational content of the value based performance measures above the traditional financial performance measures.

Furthermore, the following secondary research objective is also addressed:

- To implement a number of adjustments to the value based measures suggested in the literature, and to evaluate the influence of these adjustments.

The primary financial objective of a firm should be the maximisation of its shareholders' value. Management and shareholders alike face the problem of determining what effect management decisions will have on the future shareholder value of the firm. The firm's shareholders face the additional problem that management may not be focused on the maximisation of shareholder value, and it may be necessary for them to incur monitoring costs to ensure that this objective is achieved.

In order to monitor management it is important to have a clear understanding of the relationship between the reported financial performance of a firm and its shareholder value creation. It would thus be beneficial to identify those performance measures that have a strong relationship with shareholder value, since these measures could be employed when monitoring the firm's management. By identifying the relevant

financial performance measures, a decrease in the monitoring costs required could be achieved. Evaluating and rewarding management based on these financial performance measures should ensure shareholder value maximisation.

A number of conventional accounting-based financial measures have been developed in an attempt to evaluate the financial performance of a firm. Mixed results are obtained when the relationships between these traditional financial performance measures and share returns are investigated. The traditional measures are criticised for excluding the firm's cost of capital in their calculation and based on this, their ability to be used when evaluating value creation is questioned. Furthermore, it is argued that they focus predominantly on historic accounting information contained in the published financial statements of the firm.

The problems associated with the traditional measures contributed to the development of the value based financial performance measures. These measures attempt to overcome some of the limitations of the traditional financial measures. Amongst others, the inclusion of a firm's cost of capital in the calculation of the value based measures facilitates the evaluation of value creation. Furthermore, they attempt to remove some of the accounting distortions resulting from the use of conventional accounting information. Proponents present the value based measures as a major improvement over the traditional measures, and report high levels of correlation between them and share returns. A number of empirical studies report conflicting results, and it is consequently not clear whether these value based measures are able to outperform the traditional financial performance measures in explaining the variation in share returns.

In this study the information content of the traditional measures earnings before extraordinary items (EBEI) and cash from operations (CFO), and the value based measures residual income (RI), economic value added (EVA), cash value added (CVA) and cash flow return on investment (CFROI) are evaluated. During the period investigated, the South African economy experienced highly variable levels of inflation. Since inflation is sometimes identified as one of the problem associated with the value based measures, the study also implements the inflation adjustments prescribe by International Accounting Statement 15 (IAS15) in order to quantify

inflation-adjusted versions of the measures EVA and CVA, and evaluates the information content of the resulting real measures.

The study is conducted, based on a sample of South African industrial firms listed on the JSE, for the 15-year period 1991 to 2005. The data required to calculate the various measures are obtained from the McGregor BFA database. This database contains standardised financial statements for listed and delisted South African firms. It also contains EVA, cost of capital and invested capital values for those firms listed at the end of the research period. Including only these firms in the sample compiled for this study would reduce the number of observations. More importantly, it would expose the study to a survivorship bias. Hence additional steps are taken to estimate the values for firms delisting during the research period by using the same approach as the one employed in the database. The final sample consists of 364 firms and 3181 complete observations.

Both the relative information content of the various measures, as well as the incremental information content of their contributing components, are evaluated. The statistical test developed by Biddle, Seow and Siegel (1995) is applied. The relative information content test entails a comparison of the adjusted R^2 values obtained from regression analyses conducted with the individual measures as independent variables, and the market adjusted share return as the dependent variable. In the case of the relative information content tests the rejection of the null hypothesis indicates a statistically significant difference in the information content of two different measures. For the incremental information content test a multiple regression analysis, including all the contributing components of a measure as independent variables and the market adjusted share return as the dependent variable, is conducted. The regression coefficients of the individual components are considered to determine their contribution to the overall regression. The rejection of the null hypothesis formulated for the incremental information content test indicates that the inclusion of a specific component of the measure under investigation provides significant incremental information beyond that contained in the remaining components.

When the value based measure EVA is investigated, the results of the relative information content tests indicate that EVA does not outperform earnings (EBEI) in

explaining the variation in the market adjusted return of a firm's shares. In the majority of the tests EVA also does not manage to outperform RI, a less complex value based measure. On this basis, it appears that the relatively complex accounting adjustments required to calculate EVA do not add significant information.

The incremental information content tests show that the EVA components do not add significant additional information content beyond that contained in earnings (EBEI). More specifically, it appears that the capital charge and accounting adjustments required to calculate EVA do not add statistically significant incremental information content at all. Based on these results, claims that EVA outperforms other financial performance measures cannot be supported.

In order to investigate the effect that inflation may have on the measure EVA, an inflation-adjusted version of the measure is evaluated by applying the same approach. The results obtained indicate that the inflation-adjusted EVA does not outperform nominal EVA in explaining market adjusted share returns. Furthermore, neither of the two EVA versions is able to outperform earnings (EBEI). In the majority of the tests the two EVA versions also do not manage to outperform RI. This analysis shows that the accounting and inflation adjustments required to calculate EVA_{real} do not add any significant information.

The incremental information content tests indicate that the EVA_{real} components do not add any significant additional information content beyond that contained in RI. More specifically, it appears that the accounting and inflation adjustments required to calculate EVA_{real} do not add statistically significant incremental information content. Based on these results, claims that EVA outperforms other financial performance measures can still not be supported. The incremental information content of the inflation adjustments also does not contribute additional information content.

The measure CVA is proposed by its proponents as an improvement over EVA since it aims to convert profit figures into cash flow values, and also attempts to solve the problem associated with different depreciating methods employed by different firms. Based on the results of the relative information content tests it appears that CVA does not outperform earnings (EBEI) in explaining the variation in market adjusted share

returns either. CVA is also not able to outperform RI in the relative information content tests. Based on the results of the relative information content tests, it appears that the additional, relatively complex adjustments required to calculate CVA do not add significant information content beyond that already contained in RI.

The incremental information content tests indicate that the CVA components do add significant additional information content beyond that contained in RI. The level of significance, however, for these accounting and cash value added adjustments is lower than for the RI components. Although the contributions of the individual components are significant, the information content of the combined measure is still lower than the measure earnings (EBEI). Even though these components are statistically significant on their own, they are not economically significant when combined. Based on the results of the study it would appear that CVA does not outperform the other financial performance measures.

An inflation-adjusted version of the measure CVA (CVA_{real}) is also calculated by including the inflation adjustments recommended by IAS15. CVA_{real} is evaluated by applying the same techniques as before. The results from the relative and incremental information content tests conducted for CVA_{real} provide similar conclusions as for the nominal version of the measure. Once again, accounting earnings (EBEI) contains the highest relative information content, followed by the other measures investigated.

The measure CFROI contains a number of adjustments designed to convert the accounting-based asset and profit figures of a firm into inflation-adjusted cash flow figures. In order to evaluate the shareholder value creating potential of a firm, the difference between its CFROI value and its real cost of capital is calculated. When the relative information content of this difference between CFROI and the real cost of capital ($CFROI_{Margin}$) is investigated, the results indicate that the measure is not able to outperform EBEI in explaining market adjusted share returns. The results from the incremental information content tests indicate that the adjustments required in order to calculate the $CFROI_{Margin}$ do contribute statistically significant incremental information content. If the adjusted R^2 value of the multiple regression analysis conducted to evaluate the incremental information content of the $CFROI_{Margin}$ components is compared to the R^2 values obtained from the incremental information

content tests of the other value based measures, a much lower value is observed. Even though the individual $CFROI_{Margin}$ components contribute significant incremental information content, the combined components explain less of a firm's market adjusted share return than the combined components of the other measures investigated in this study.

9.3 CONCLUSIONS

The underlying hypotheses of this study are indicated as follows in Chapter 1:

H_{01}: There are no differences in the information content of the various measures.

H_{02}: A specific component of a measure does not provide information content beyond that provided by the remaining components.

Based on these hypotheses, the following conclusions are relevant to this study:

- Although the EVA proponents report high levels of correlation between the measure and share returns, the results of this study do not support their claims that EVA outperforms other measures of financial performance. EBEI, a relatively simple traditional financial performance measure that is directly available from a firm's published financial statements, outperforms EVA in the relative information content tests. The value based measure RI also manages to outperform EVA. If the incremental information contents of the EVA components are considered, it becomes clear that they do not add significant information content beyond that already contained in EBEI.

- In order to calculate an inflation-adjusted version of the measure EVA, the inflation adjustments proposed by IAS15 are quantified during a period characterised by decreasing, increasing and low levels of inflation. The difference between the nominal and inflation-adjusted EVA values is found to be statistically significant both for the full period data, as well as for the three

inflation sub-periods. When conducted for EVA_{nom} and EVA_{real}, the results of the relative information content tests indicate that both the EVA measures do not outperform earnings in explaining the variation in the market adjusted return of a firm's shares. In the majority of these tests RI also manages to outperform both EVA_{nom} and EVA_{real}. Based on this, it appears that the accounting and inflation adjustments required when calculating EVA_{nom} and EVA_{real} do not add any significant information. The incremental information content tests indicate that the EVA_{real} components do not add any significant additional information content beyond that contained in RI. More specifically, it appears that the accounting and inflation adjustments do not add statistically significant incremental information content at all. Based on these results claims that EVA_{nom} and EVA_{real} outperform other financial performance measures can not be supported. The incremental information content of the IAS15 inflation adjustments is also not significant.

- The value based measure CVA is also evaluated. The results of the relative information content tests indicate that CVA_{nom} is not able to outperform the other measures when attempting to explain the variation in a firm's market adjusted share returns. EBEI once again exhibits the highest adjusted R^2 value for the relative information content tests. The incremental information content of the accounting and cash value added adjustments required to calculate EVA_{nom} and CVA_{nom} do contain additional information beyond that provided by RI, but the level of statistical significance is low. Evaluating the inflation-adjusted EVA and CVA values obtained after the inclusion of the IAS15 inflation adjustments provide similar results. Based on these results, claims that CVA outperform the other measures cannot be supported.

- The results from the relative information content tests of $CFROI_{Margin}$ provide mixed results. If the signs of the measures are ignored, $CFROI_{Margin}$ is ranked second (after EBEI) in the relative information content tests. When allowing different correlation coefficients for positive and negative values of the measure, however, $CFROI_{Margin}$ displays the lowest relative information content of the measures investigated. This is in contrast with the other value based measures,

which exhibit increased relative information content levels under these circumstances.

The results from the incremental information content tests indicate that the adjustments required to calculate the $CFROI_{Margin}$ contribute statistically significant incremental information content beyond that contained in the remaining measures. If the adjusted R^2 value of the multiple regression analysis is compared to the adjusted R^2 values obtained from the incremental information content tests of the other value based measures a much lower value is observed. This indicates that the $CFROI_{Margin}$ components explain less of the variation in a firm's market adjusted share returns than the other measures investigated in this study.

9.4 RECOMMENDATIONS

Based on the results reported in the preceding chapters, and the conclusions reached, the following recommendations are presented:

- Proponents of the value based measures present them as a major improvement over the traditional financial performance measures. Amongst others, they claim that the value based measures are superior to the traditional measures when evaluating shareholder value creation. The results of this study indicate that this is not the case for the measures EVA, CVA and CFROI. Based on the relative information content tests, EBEI explains a larger portion of the variation in a firm's market-adjusted share returns. EBEI is a relatively simple financial performance measure that is easily obtainable from a firm's published financial statements, and it does not require the complex adjustments included in the calculation of the value based measures. Based on the results of this study it appears that under most circumstances EBEI provides a higher level of information content than the other measures evaluated.

- If the relative information content of the value based financial performance measures are considered, RI provides the best overall results. This measure is easier and less complex to calculate than the other value based measures, and the incremental information content tests indicate that by including the relatively complex calculations beyond those required to quantify RI (such as the accounting, inflation, CVA and CFROI adjustments) relatively little incremental information content is provided. Based on the results of this study it would thus appear that the implementation of the measure RI allows a firm to make provision for its cost of capital when evaluating financial performance, and also provides the majority of the information content contained in the more complex value based measures.

- Pronounced improvements in the results of the relative information content tests are observed for the value based measures if the regression analysis is repeated after provision is made for positive and negative values. Based on these results it appears as if the size of the change in market adjusted share returns is smaller for firms reporting negative value based financial performance measures than the size of the change in the returns observed for firms reporting positive value based figures. When applying the value based measures for financial evaluation and valuation purposes, the overall results achieved should be improved if this distinction between firms generating positive and negative values is allowed. In most cases these improvements are still not large enough for the value based measures to outperform EBEI. Under certain circumstances, however, the results obtained for the measure RI are better than those reported for EBEI.

9.5 RESEARCH CHALLENGES AND FUTURE RESEARCH

A number of research challenges were faced during this study. The following challenges are highlighted:

- When a firm's CFROI values are evaluated, firm-specific discount rates are normally used. These rates, however, are not available from publicly available sources, and are excluded from this study. The firm's real cost of capital was used instead.

- It is conceivable that even though EVA is not more strongly related to share returns than earnings, that the introduction of EVA as a management tool may induce behaviour that increases value. This information is not readily available for the sample used in this research, and was not investigated. Distinguishing between information content of adopters and non-adopters of value based financial performance measures could provide a valuable extension to the research where such data are available.

Based on the conclusions and recommendations mentioned in the preceding sections, future research focusing on the following aspects could build on the results presented in this study:

- In this study, a method that can be applied to evaluate relative and incremental information content is employed to evaluate some traditional and value based measures and their contributing components. In future studies this method may be applied to evaluate other financial performance measures. A large number of other traditional financial performance measures, which are not included in this analysis, could be evaluated. Various other value based measures, whose calculations require data not available from publicly published sources, were excluded from this study. Including these measures in the information content tests could extend the results reported in this study.

Attempts could also be made to improve the results obtained by the method employed in this study by using other measures of share returns as the dependent variable. Examples of these alternative measures of share return include excess share returns or risk adjusted share returns.

- The value based measures investigated in this study are all surplus measures that attempt to calculate the surplus profits or cash flows above the firm's total cost of capital. In future studies, dependent variables that are calculated as surplus share returns could be considered to determine whether a higher degree of correlation exists between the value based measures and these surplus share returns. An example of such a dependent variable would be the measure market value added (MVA), which is calculated as the difference between the market value of a firm's capital, and the book value of its invested capital.

- From the results obtained in this analysis, residual income (RI) was identified as the most promising of the value based measures. In terms of the other value based measures, which are heavily promoted and advertised by the consulting firms that employ them, this is a somewhat neglected measure. A future study could, therefore, focus on the characteristics of RI. The focus of such an analysis could be placed on identifying those components of the measure RI that provide the highest levels of incremental information content.

- In this study the inflation adjustments prescribed by International Accounting Standard 15 (IAS15) are included in the calculation of the inflation-adjusted measures. Other methods of adjusting the published financial information of a firm could also be identified or developed, and their information content evaluated. After a period of relatively low and stable inflation levels in the South African and world economies, inflation levels have recently started to exhibit increasing values again. Consequently, it is once again important to consider the possible distorting effects of inflation on the financial performance of a firm. Future studies that focus on the development of alternative inflation adjustments would provide valuable information with regard to the evaluation of firms on an inflation-adjusted basis.

This study tested a number of traditional and value based financial performance measures. Based on the results reported in the study, claims that the value based measures EVA, CVA and CFROI outperform the traditional financial performance measures cannot be supported. In future research, an investigation of the relationship between other financial performance measures and share returns should contribute to an improved understanding of the components of a firm's financial performance that have an influence on its value creating potential.

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